DOCUMENT RESUME

ED 450 679 HE 033 855

AUTHOR	Zucker, Brian; Dawson, Royal
TITLE	Credits and Attainment: Returns to Postsecondary Education Ten Years after High School. Statistical Analysis Report. Postsecondary Education Descriptive Analysis Reports.
INSTITUTION	National Center for Education Statistics (ED), Washington, DC.; Human Capital Research Corp., Chicago, IL.
REPORT NO	NCES-2001-168
PUB DATE	2001-03-00
NOTE	88p.
AVAILABLE FROM	ED Pubs, P.O. Box 1398, Jessup, MD 20794-1398. Tel: 877-433-7827 (Toll Free); Web site: http://www.ed.gov/pubs/edpubs.html.
PUB TYPE	Numerical/Quantitative Data (110) -- Reports - Research (143)
EDRS PRICE	MF01/PC04 Plus Postage.
DESCRIPTORS	*College Credits; College Preparation; Demography; *Educational Attainment; Educational Experience; *High School Graduates; High Schools; Higher Education; *Income; *Student Characteristics; Tables (Data); Work Experience
IDENTIFIERS	High School and Beyond (NCES); *Return on Investment

ABSTRACT

This analysis examined 16 student characteristics and their association with earnings 10 years after high school. The study used data from the High School and Beyond Longitudinal Study (HS&B) and the HS&B Postsecondary Education Transcript (PETS) file. The information in these files was gathered through a nationally representative survey of high school sophomores in 1980 with several follow-up surveys. To facilitate the analysis, characteristics were organized around four broad aspects of experience and backgrounds: (1) demography and family background; (2) high school preparation; (3) postsecondary experience; and (4) early work experience. As of 1992, just under 63% of the students had at least some college, and 42% had completed a program leading to a degree or certificate. Student educational attainment was closely related to several aspects of sociodemographic background. After controlling for academic and labor force experiences and background characteristics, a baccalaureate or associate's degree was shown to contribute significantly to earnings, and the results were generally consistent with what others have estimated. Students with a bachelor's degree earned about 23% more on average than students with no college, and for students with an associate's degree, there was about 19% differential compared with high school graduates. However, after controlling for multiple aspects of student experience and background, the economic returns of some college credits, apart from degree completion, were negligible. When coursework was vocationally focused, there was more likely to be an association with higher earnings. Three appendixes contain tables of regression analysis control variables, a glossary, and technical notes. (Contains 32 tables, 2 figures, and 22 references.) (SLD)

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Suggested Citation
U.S. Department of Education. National Center for Education Statistics. *Credits and Attainment: Returns to Postsecondary Education Ten Years After High School.* NCES 2001–168, by Brian Zucker and Royal Dawson. Project Officer: C. Dennis Carroll. Washington, DC: 2001.

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Executive Summary

While the advantages of earning a postsecondary education degree—particularly a bachelor's degree—are well documented, the literature is less conclusive about the economic and social impact of postsecondary education credits apart from degree completion. Different conclusions about the economic return of a college education reflect different populations and time periods of analysis with variations in how a student's background, education, and labor force experience were defined and measured.

Although there is in general a pronounced earnings differential for those with and without a bachelor's degree, not all non-college bound students or students with some college but no credential fare poorly in the labor market or fail to acquire highly marketable skills.

Clarifying the economic outcomes of those with a high school education but no college, and those with some college but no degree, and understanding the relationship of factors that potentially affect individual earnings may help to clarify the alternatives and risks of either not pursuing a postsecondary education, or completing some college credits in lieu of a degree. In turn, this information can help guide the strategies and investment decisions of students, educators, and employers.

This analysis examines 16 student characteristics and their association with earnings 10 years after high school. To facilitate the analysis, these characteristics are organized around four broad aspects of experience and background (referred to as the earnings framework) as shown below.

Demographic and family background
• Race/ethnicity
• Gender
• Family income in 1980
• Parent education attainment in 1980
High school preparation
• Academic preparation
• Extra-curricular involvement
Postsecondary experience
• College aspirations
• Initial type of institution attended
• College GPA
• Vocational versus liberal arts focus
• Depth versus breadth of curriculum
• Timing of entry
• Undergraduate major
• Education attainment
Early work experience
• Employment while in high school
• Early work experience (1983–86)

Attainment and Background

As of 1992, just under 63 percent of all students from the sophomore class of 1980 had at least some college, and 42 percent (about two-thirds of those who attended college) completed a program leading to a degree or certificate. In other words, about one in five students (22 percent) from this cohort attended

college but did not complete a program leading to a degree or certificate.

Students with some college were almost evenly divided into those who completed 15 or fewer college credits, those who completed 16 to 40 credits, and those with more than 40 credits.

Students with some college who fall into these three categories of attainment, varied not only with respect to credit production, but across a range of other characteristics as well. In broad terms, as discussed in this report, students with some college, particularly those who completed more than 40 credits, were most similar to students with a bachelor's degree, while students who completed 16 to 40 credits were closer in profile to those with an associate's degree. By contrast, students who completed 15 or fewer credits resembled those with no college in some instances and those with an associate's degree or vocational certificate in others.

Student attainment was closely related to several aspects of social-demographic background including, race, gender, family income and parent attainment. Females, for example, were more likely than males to attend college, while black, Hispanic, and American Indian students were less likely than either white or Asian students to attend college or complete a bachelor's degree. In addition, students with a 1980 family income of $40,000 and above were more than three times as likely to have completed a bachelor's degree and more than four times as likely to have completed a graduate degree than a student with a family income under $15,000. Similarly, students with a bachelor's degree were more than twice as likely to have come from families where one or both parents completed a bachelor's degree while those with only a high school diploma were more than six times as likely to come from a family where neither parent attended college.

Attainment and Earnings

After controlling for academic and labor force experiences and background characteristics, a baccalaureate or associate's degree was shown to contribute significantly to earnings and the results were generally consistent with what others have estimated.[1] Based on the ratio of "adjusted mean" earnings—which take into account the covariance of other confounding factors—students with a bachelor's degree, on average, earned about 23 percent more than students with no college. For students with an associate's degree, there was about a nine percent earnings differential compared with high school graduates. For students with some college, there appeared to be about a six to nine percent mean earnings differential over those with no college (depending on the number of credits completed), but there was not enough statistical evidence to draw this conclusion. In other words, after controlling for multiple aspects of student experience and background, the economic returns of some college credits apart from degree completion were negligible—irrespective of the number of credits completed. The

[1] See, for example, Kane and Rouse (1993).

lack of a return for students with some college (but no degree), who in particular completed 40 or more credits suggests that credit production in the absence of a meaningful integration of courses contributes little to individual earnings and/or that there are considerable economic gains that can be attributed to the degree credential itself.

Postsecondary Education Experience

While students with some college, on average, showed the same level of earnings as students with no college, there were numerous instances in which specific aspects of a postsecondary education experience were associated with higher earnings. These include students whose course work was vocationally (as opposed to general education) focused, students with undergraduate majors in computer science, health technology, business and engineering, students who achieved a balance of breadth versus depth of study in their curriculum, and students who attained a cumulative GPA of 3.0 or higher. Differences in earnings were also observed by type of institution first attended, with students who attended private not-for-profit four-year institutions compared with those who attended a two-year public. By contrast, there was no difference in earnings for students who attended a public four-year institutions compared with those who attended a public two-year institution, controlling for other factors.

In broader terms, the earnings gain associated with these various characteristics suggest that postsecondary education curriculum and academic performance, along with other aspects of the postsecondary education experience, may figure prominently in the economic returns to a postsecondary education.

Early Work Experience

Apart from attainment and selected aspects of the college experience, the findings from this analysis suggest that labor force experience constitutes an important component of the earnings equation. Based on the findings of the multiple regression analysis, workforce experience during high school and during the four years immediately following high school can contribute significantly to individual earnings. While this association potentially reflects differences in motivation as well as experience, the findings nonetheless suggest that an enriching early work experience may provide students with an important channel for such motivation, and in effect mitigate some of the economic disadvantages of not having a college degree.

As with questions concerning college access, however, higher rates of unemployment and a greater likelihood of falling into the bottom third of the high school job index or the early work index suggest that some students, such as black and American Indian students (who are less likely to complete college), may have less access to enriching employment opportunities as well.

In broader terms, the association between education attainment, early employment and earnings suggest that the greatest gains in

individual earnings are most likely to accrue through a combination of work and postsecondary education. And, while the responsibilities of employment may compete with educational activities, work experiences in some instances can be mutually facilitating and mutually reinforcing.

Background and Social Mobility

The last set of observations concerns the influences of socioeconomic background and economic mobility. In combination, several elements of students' background, including family income and high school academic preparation were associated with earnings both directly and indirectly through an association with higher attainment.

While the findings from this analysis reaffirm the central role of education (at both the high school and postsecondary level) as a vehicle of social mobility, in actuality, for the sophomore class of 1980, the earnings distribution of students 10 years after high school remains closely associated with socioeconomic status during high school. In other words, while education is positively related to individual earnings—irrespective of socioeconomic background—the direct and indirect effects of family income still constitute a dominant factor in the formation of an individual's earning capacity.

Nowhere is this impact more clearly illustrated than with the racial/ethnic background of students. After controlling for all other characteristics in the earnings framework, there was no difference in student earnings by race/ethnicity. While at one level this finding suggests that something of an economic parity with respect to race/ethnicity exists in the labor market, it is crucial to recognize the extent to which this balance is offset by the overall disparity in attainment for blacks, Hispanics, and American Indians compared with whites or Asians.[2]

While observed differences in earnings by race ethnicity are more directly attributable to differences in attainment than other factors, the same cannot be said with respect to gender. Indeed, for the sophomore class of 1980, females were more likely to attend college than males and had equivalent baccalaureate and advanced degree rates of attainment. At the same time, after controlling for all factors in the model, there remains a pronounced earnings differential by gender with an adjusted mean earnings for females that is approximately 18 percent less than for males.

While this disparity may in part be accounted for by differences in occupational employment –which was not considered in the earnings framework– this finding nonetheless brings with it a number of implications including questions about comparative differences in a college education's economic return on investment, and in the level of college debt that students may ultimately be able to assume. At the same time, the positive associa-

[2]For the sophomore class of 1980, blacks, Hispanics, and American Indians were less than half as likely as white students and less than one-third as likely as Asians to attain a bachelor's degree.

tion between attainment and earnings remains, regardless of gender. Therefore, while economic parity, by definition, cannot be achieved through offsets in attainment for those who are otherwise disadvantaged, attainment nonetheless serves to mitigate those disparities.

Foreword

This report analyzes the economic returns to a college education for the sophomore class of 1980 10 years after their senior year of high school. The analysis focuses on students with some postsecondary education credits but no degree and compares the experiences and outcomes of this group with students with no postsecondary education as well as those with a degree or vocational certificate. The analysis examines 12 characteristics of student background and their association with education attainment and earnings 10 years after high school.

The report uses data from the High School and Beyond Longitudinal Study and the HS&B Postsecondary Education Transcript (PETS) File. The information provided through these files was gathered through a nationally representative survey of high school sophomores in 1980 with several follow-up surveys administered approximately every two years; the last one took place in 1992.

The estimates presented in this report were produced using the NCES Data Analysis System (DAS) for the HS&B: 80/92 survey. The DAS is a microcomputer application that allows users to specify and generate their own tables and summary statistics. The DAS produces design adjusted standard errors necessary for testing the statistical significance of differences shown in the tables. For more information regarding the DAS, readers should consult Appendix C of this report.

Acknowledgments

The authors wish to thank Laura Horn at MPR Associates for her sustained guidance, insightful comments and infinite patience. We are also grateful to a number of other individuals at MPR Associates for their ongoing assistance in this effort including Robert Fitzgerald, Vicky Dingler and Shirley He.

The authors also gratefully acknowledge the careful reviews and thoughtful comments provided by the following individuals: Dennis Carroll, Lisa Hudson and Paula Knepper, Andrew Kolstad and Roslyn Korb of NCES; Elaine Gilby from PES, Kent Phillippe from the American Association of Community Colleges, Jeff Owings from ESLSD. Finally, we'd like to thank Clifford Adelman for his guidance at the early stages of this report's development.

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Introduction

While the advantages of earning a postsecondary education degree—particularly a bachelor's degree—are well documented, the literature is less conclusive about the economic and social impact of postsecondary education credits apart from degree completion.[3] Different conclusions regarding the economic return for students who have not completed college reflect differences in research methodology, different populations and time periods of analysis, and different data sets, with variations in how specific aspects of student background, education, and labor force experience were defined and measured.

Although there is in general a pronounced earnings differential for those with and without a bachelor's degree, not all non-college bound students or students with some college but no credential fare poorly in the labor market or fail to acquire highly marketable skills. Clarifying the economic outcomes of those with a high school education but no college, and those with some college but no degree, and understanding the relationship of factors that potentially affect individual earnings may help to clarify the alternatives, opportunities and risks of either not pursuing a postsecondary education, or completing some college credits in lieu of a degree. In turn, this information can help guide the strategies and investment decisions of students, educators, and employers.

Report Organization

Recognizing that individual earnings are potentially associated with multiple factors, this analysis compares the developmental experiences of the high school sophomore class of 1980 who graduated from high school in 1982. The analysis is based on 16 selected demographic, social, and economic characteristics, and explores the association between these factors and annual earnings about 10 years after the senior year of high school (i.e., earnings in 1991). Imparted

[3] Kane and Rouse (1993), for example, have found that "returns to a credit at a two-year or four-year college are both positive and similar: roughly four to seven percent for every 30 (two semesters of) completed credits, and that the certification value of a degree appears to be small relative to the value of the coursework." In contrast, Grubb (1995) has found that "short periods of time in postsecondary education have uncertain effects." For women, Grubb concludes that students must complete three or more years of college to achieve significantly higher earnings, while for men, the effects of small amounts of college—less than one year—are usually too small to be statistically significant and are essentially zero for younger cohorts. Different outcomes reflect differing approaches by researchers to discern the marginal effects of a postsecondary education while controlling for other confounding factors. Notably, to the extent that certain potential influences have been excluded and those factors are associated with other characteristics that have been considered, conclusions about the marginal effects may differ.

through family, school, work, and community, these 16 characteristics represent the primary ways through which individuals acquire skills, experience, and credentials that contribute to earnings later in life. In broad terms, this framework is indicative of models of human capital investment and a body of research that began in the early 1960s with Gary Becker and Edward Denison.[4] Figure 1 summarizes these factors within four broad dimensions of student experience and background.

Figure 1—Variables included in earnings framework[5]

Demographic and family background	High school experience and preparation	Postsecondary experience	Early Work experience
• Race ethnicity	• Academic preparation	• College aspirations	• Employment while in high school
• Gender	• Extra-curricular involvement	• Initial type of institution attended	• Early work experience (1983–86)
• Family income in 1980		• College GPA	
• Parent education attainment in 1980		• Vocational versus liberal arts focus	
		• Depth versus breadth of curriculum	
		• Timing of entry	
		• Undergraduate major	
		• Education attainment	

Using this framework, observations were made about the distributions of each characteristic by level of education attainment and its association with earnings. This stage of the analysis relied primarily on descriptive statistics and serves to introduce each of the variables and the motivation for its inclusion. In the second stage, a series of multiple regression models were constructed to assess the marginal effect of each factor on earnings while controlling for all other characteristics. In combination, these two methods of analysis were used to explore the following questions.

Demographic and Family Background

- How do differences in family–demographic background relate to differences in college participation and education attainment?
- Are certain aspects of family background, such as parent education attainment or family income, associated with comparatively higher student earnings 10 years after high school?

[4] See, for example, Becker (1964) or Denison (1962).

[5] Definitions for all variables used in the analysis can be found in Appendix B—Variable Glossary.

High School Experience and Preparation

- How do the high school experiences of students with some college compare with students who have completed an associate's or bachelor's degree, or with students who did not attend college?
- Do students with different levels of high school academic preparation but comparable levels of education attainment have significantly different earnings later in life?

Postsecondary Experience

- Do students with some college demonstrate substantially different postsecondary education experiences in terms of type of institution attended, grades, or academic focus, compared with those who complete a bachelor's or associate's degree?
- How are various aspects of postsecondary experience such as grades, curriculum, or type of institution associated with student earnings after college?
- After controlling for other differences in background such as early work experience, high school preparation and social characteristics, what are the marginal effects of attainment on earnings?

Work Experience

- How do work experiences differ for students with some college, compared with students who completed an associate's degree or with students who did not attend college?
- To what extent is work experience in the years immediately following high school associated with comparatively higher earnings later in life?

Data and Definitions

The data used in this analysis was based on the High School and Beyond (HS&B) data set including the Sophomore Fourth Follow-up and the Sophomore Postsecondary Education Transcript Study (PETS). In combination, these two files supported the construction of a series of measures that were used to represent each of the characteristics considered in the analysis. The HS&B data set was particularly valuable for capturing information regarding student's demographic and family background, college aspirations, work experience and earnings. The PETS data set provided detailed information on high school academic preparation, what postsecondary courses the 1980 high school sophomores studied, the type of postsecondary institution students attended, the number of credits and credential(s) earned, and the grades students received.

Subject Population

While this study examines the earnings of young adults at all levels of attainment, students with some college credits but no degree are a focal point of this analysis. To put the experiences of these students into perspective, this group is compared throughout with the sample of 1980 sophomores whose formal education ended with high school graduation in 1982, as well as those students who completed a vocational certificate, associate's or bachelor's degree, or higher.

As of 1992, just under 63 percent of all young adults from the sophomore class of 1980 had at least some postsecondary education, and 42 percent (about two-thirds of those who attended college) completed a program leading to a degree or certificate (see table 1). In other words, about one in five students (22 percent) from this cohort attended college but did not complete a program leading to a degree or certificate.[6]

Students with some college were almost evenly divided into those who completed 15 or fewer college credits, those who completed 16 to 40 credits, and those with more than 40 credits. Nearly all students at the low end of this spectrum completed less than the equivalent of one full semester of course work, and can generally be characterized as incidental students "whose records consist either of nothing but withdrawals, incompletes, and failures or who take two or three courses and then disappear from education."[7] The other end of the spectrum (students who have

[6]In this analysis, the student education attainment variable was derived using transcript data from the PETS file where available, and self-reported education (Hdeg) for all other students.

[7]Adelman (1995,22) For the sophomore class of 1980, 6.7 percent of all students completed 10 or fewer credits or what Clifford Adelman referred to as the incidental student. For a more complete discussion of the definition of an incidental student, see Adelman (1995,22).

completed more than 40 credits) consists largely of students who completed the equivalent of three or more semesters of course work.

Students with some college who fall into these three categories of attainment, varied not only with respect to credit production, but across a range of other characteristics as well. In broad terms, students with some college who completed more than 40 credits were most similar to students with a bachelor's degree, while students who completed 16 to 40 credits were closer in profile to those with an associate's degree. By contrast, students who completed 15 or fewer credits resembled those with no college in some instances and those with an associate's degree or vocational certificate in others.

Measuring Student Earnings and Returns to Education

While nearly all studies on the returns to a college degree have shown a positive relationship between individual earnings and attainment, they have often varied in their more detailed findings.[8] These differences raise questions, not only about methodology but about the dynamics of income and how cyclical and structural changes in the economy can alter the economics of a college education across time and space. Given the variation in conclusions drawn about education's return on investment, it is particularly important to examine how earnings have been defined and the context in which earnings and attainment have been measured.

In this study, all comparisons of earnings were based on student self-reported annual earnings in 1991 (about 10 years after high school) as reported in the HS&B Fourth Follow-up. These estimates excluded students with zero earnings, but otherwise represented students at all other configurations of employment—regardless of type of employment (e.g., self-employed, military, and civilian) or level of earnings.

Although the HS&B Fourth Follow-up did not include questions about hours of employment or number of weeks worked, students were asked about the total months they worked, in addition to a series of questions regarding their primary activities in 1991 (e.g., school, work, travel, etc.). In the absence of information about hours of employment, it is important to recognize that education attainment contributes to higher earnings not only because hourly compensation tends to be higher, but because there is a greater likelihood of full-time/full-year employment.[9]

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[8]For review, see Boesel (1999).

[9]For example, based on March Current Population Survey data, employment population ratios and the percent working full time year round increases with education attainment. Overall, about 85 percent of the sophomore class of 1980 were employed for all 12 months of 1991. In the multiple regression phase of this study, two control variables are included as surrogates for labor force

Because differences in earnings by level of education attainment tend to increase with a person's age, the length of time from high school until earnings were measured can also affect conclusions about the returns of a college degree.[10] While the HS&B Fourth Follow-up is the most recent data available and provided a 10-year horizon, it is still more than a decade short of when earnings differentials by level of education attainment tend to peak.

Conclusions about the returns to a college education for the sophomore class of 1980 also reflect conditions in the labor market for the year in which earnings were examined. With the first quarter of 1991 still in recession and the balance of the year considered a period of recovery, individuals with lower levels of education attainment experienced comparatively sharper decreases in real earnings and prolonged spells of unemployment. As a result, the returns to education for students with some college and those with an associate's degree may have been lower than would otherwise be concluded if comparisons were made during a period of economic expansion when demand for less educated workers tends to be higher.[11]

In comparing differences in mean earnings across different populations, it is also important to recognize that the distribution of earnings may be high skewed. For example, based on CPS data, mean earnings for males and females employed full-time, year-round are consistently higher than median earnings with differences that tend to increase with attainment.[12] For the HS&B cohort, the distribution in earnings (table A) are moderately skewed as well. As a result, differences in mean earnings by level of attainment may in some instances be slightly higher than differences at the median.

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activity. These include a dummy variable for students who are concurrently enrolled in college while employed, and a dummy variable indicating that a student had earnings below the 1991 minimum wage level, or worked less than full-time and/or less than full year at minimum wage.

[10]Using the March 97 CPS data, the earnings differential by level of attainment may peak anywhere from age 40 to 44, when comparing males with an associate's degree versus no college, 54 to 59, when comparing males with a bachelor's versus an associate's degree, and 60 to 64, when comparing males with a master's versus a bachelor's degree. In no instance, in absolute or relative terms, do earnings differentials peak for individuals in the mid-thirties or younger. Most comparisons using longitudinal data have used a shorter horizon, in part, because longer term data is generally unavailable. Kane and Rouse (1993) and Grubb (1995), among others, have used a 14 -year horizon (e.g., age 32) to measure economic returns. While extending the horizon may help reveal the full economic return of a postsecondary education, it also brings with it the disadvantage of moving further from the labor market conditions that current cohorts are likely to face.

[11]According to CPS data, from 1989 to 1991, constant dollar earnings fell by 6.1 percent for males age 25 and older with less than four years of college and by 9.1 percent for females. In contrast, constant dollar earnings fell by 4.8 percent for males with a high school diploma and 5.7 percent for females, while earnings for males and females with four years of college declined by 1.6 and 1.1 percent respectively—Table P-14 Historical Income Tables—People. Note: the definitions used by the Current Population Survey to define education attainment (prior to 1992) are not directly comparable to those used in this study.

[12] See for example Money Income in the United States, 1999 Current Population Reports Consumer Income Series P-60, US Census Bureau

Table A—Selected 1991 earnings centiles and average earnings of 1980 sophomores who graduated from high school in 1982, by level of education attainment in 1992, and gender.

	High school or less	Some college (0–15 credits)	Some college (16–40 credits)	Some college (above 40 credits)	Associate's degree or certificate	Bachelor's degree	Advanced degree
				Males			
10th percent centile	$13,624	$11,421	$12,010	$7,900	$11,327	$14,263	$9,691
25th percent centile	18,574	14,870	15,482	14,307	17,413	21,031	18,558
50th percent centile	27,305	22,255	22,010	22,216	23,931	28,582	28,937
75th percent centile	34,871	30,750	27,712	29,180	31,132	37,000	40,272
90th percent centile	42,405	38,918	36,636	39,865	38,386	44,330	45,526
Mean	27,445	24,782	23,835	24,247	24,992	29,728	29,934
				Females			
10th percent centile	4,208	4,109	5,161	5,558	7,070	8,311	7,596
25th percent centile	9,153	11,151	12,175	11,446	12,604	16,817	14,950
50th percent centile	13,447	17,998	17,693	17,606	18,855	24,250	23,524
75th percent centile	20,669	23,730	23,601	23,049	25,110	30,320	30,212
90th percent centile	26,257	30,666	29,297	28,781	32,396	37,452	39,764
Mean	14,875	18,960	18,431	18,564	20,138	24,150	24,291

NOTE: Row percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Finally, because the HS&B Fourth Follow-up does not contain geographic information, observed differences in earnings by level of attainment may also reflect differences in cost of living and compensation from one region to the next. To the extent that a region with comparatively lower attainment also had comparatively lower compensation (all other factors being equal), the analysis may overstate the contribution that attainment makes to earnings by failing to control for such geographic differences.

Student Background

Demographic–Social Background and Education Attainment

Demographic and social characteristics including gender, race/ethnicity, family income, and parent education attainment reflect innumerable differences in a student's home and community environment with potential bearing on quality of schooling and access to peers, role models, and networks of support.[13, 14]

For the sophomore class of 1980, demographic–social background figures prominently in the education attainment of students (table 1). Females, for example, were more likely than males to attend college. Black, Hispanic, and American Indian students were less likely than either white or Asian students to attend college or complete a bachelor's degree. Asian students demonstrated the highest overall attainment and were more likely than white students (who had the second highest levels of attainment) to attend college or earn a graduate degree.

Student attainment was also associated with family income; students from moderate income ($15,000 to $24,999) families were more likely to complete a bachelor's degree than those from low income families (under $15,000) and students from middle income families ($25,000 to $40,000) were more likely to complete a bachelor's degree than those from moderate income families. For the sophomore class of 1980, a student with a family income of $40,000 and above was more than three times as likely to have completed a bachelor's degree and more than four times as likely to have completed a graduate degree than a student with a family income under $15,000.

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[13]Numerous studies have examined socio-economic status and its relationship to attainment and earnings. For a capsule review, see, for example, Pascarella and Terenzini (1991, 524–525).

[14]This analysis used three categories of parent attainment: (1) neither parent has attended college; (2) one or both parents have attended college and have completed up to an associate's degree or a vocational certificate but less than a bachelor's degree; and (3) one or both parents have earned at least a bachelor's degree. A more complete discussion of the parent education attainment variable is given in the appendix.

Table 1—Percent distribution of 1980 sophomores who graduated from high school in 1982, by level of education attainment in 1992, by gender, by race/ethnicity, by family income in 1980, and by parent's education attainment.

	High school or less	Some college (0–15 credits)	Some college (16–40 credits)	Some college (above 40 credits)	Associate's degree or certificate	Bachelor's degree	Advanced degree
Total	37.1	7.0	7.9	6.6	14.3	19.0	8.2
Gender							
Male	40.6	6.1	7.8	6.4	12.2	18.7	8.1
Female	33.6	7.9	7.9	6.9	16.2	19.3	8.2
Race/ethnicity							
White	34.2	6.9	7.5	6.2	14.5	21.4	9.3
Black	45.3	7.6	9.5	9.7	13.6	10.6	3.7
Hispanic	51.6	7.6	8.4	6.3	14.5	8.3	3.3
Asian or Pacific Islander	17.6	4.6	6.3	10.5	10.9	30.2	19.9
Native American	49.6	9.2	14.5	5.5	11.2	9.0	1.1
Family income in 1980							
$0–14,999	47.0	7.3	9.6	7.0	13.9	11.3	3.9
$15,000–24,999	32.6	7.2	9.0	6.1	18.8	18.9	7.5
$25,000–39,999	26.6	7.4	8.2	7.4	14.7	25.7	10.0
$40,000 or more	18.4	6.1	6.6	10.0	11.7	30.2	17.0
Parent education attainment							
No college	51.4	6.5	6.2	4.5	19.4	9.5	2.6
Some college/associate's degree	29.6	6.7	7.4	7.8	22.4	18.9	6.9
Bachelor's degree or higher	14.2	4.6	5.3	7.9	15.1	35.7	17.2

NOTE: Row percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Student education attainment was also closely associated with the attainment of their parents (table 2). For instance, among students with a bachelor's degree, about half came from families where one or both parents completed a bachelor's degree or higher compared with slightly more than one in five for students with parents who did not attend college (table 2) By contrast, among students with no college, nearly two-thirds came from families where neither parent attended college while one in ten came from families where one or both parents completed a bachelor's degree or higher.

Among students with some college, the likelihood of coming from a family where one or both parents had a bachelor's degree was greater for students with more than 40 credits. In general, parents of students with less than 40 credits had similar educational attainment to parents of

students with an associate's degree. While parent attainment for students with more than 40 credits was higher than those with fewer credits or an associate's degree, but still below the parental attainment of those students who completed a bachelor's degree or higher.

Table 2—Percentage distribution of 1980 sophomores who graduated from high school in 1982, by parent's education attainment and by level of education attainment in 1992.

	Neither parent attended college	One or both parents have an associate's degree or some college	One or both parents have a bachelor's degree or higher
High school diploma only	65.7	24.2	10.1
Enrolled in any postsecondary education total	32.7	31.6	35.8
Some college (0–15 credits)	47.1	32.8	20.1
Some college (16–40 credits)	45.0	34.6	20.5
Some college (above 40 credits)	32.3	35.2	32.5
Students with some college total	41.6	34.2	24.2
Associate's degree or certificate	43.2	34.8	22.0
Bachelor's degree	22.5	28.4	49.1
Advanced degree	15.5	26.8	57.8

NOTE: Row percentages may not add to 100 due to rounding.
SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Comparative Earnings by Background and Education Attainment

For the sophomore class of 1980, males and females with a bachelor's degree had higher earnings than students with lower levels of attainment (table 3).[15] At the sub-baccalaureate level, the returns to education were less conclusive. Males with some college, for example, had the same earnings as males with no college—regardless of the number of credits completed, while females with some college had higher earnings than those with no college. At the same time, males and females with some college had the same earnings as students with an associate's degree.

In certain instances, after considering education attainment, earnings also differed by race/ethnicity. Black males with a graduate degree, for example, had lower earnings than their Asian counterparts, while black males with no college had lower earnings than their white counterparts.

[15]There was no difference in earnings for males or females with a graduate degree compared with those who have earned a bachelor's degree (.17) (.15). In part, this similarity may be a function of time out from college. For students who have completed a graduate degree, even under timely completion, the average master's degree holder would have been "in the field" less than five years.

Apart from the indirect influence that family background brings to earnings through attainment, there is a direct association as well. For example, males and females from families with incomes of $25,000 and above who did not attend college had higher earnings than students with no college from families with incomes under $15,000. Similarly, males with a bachelor's degree from families with incomes of $40,000 and above had higher earnings than males with a bachelor's from families with incomes under $15,000.

Table 3—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, by level of education attainment in 1992, by race/ethnicity, by family income in 1980, by parent's education attainment, and by gender.

	High school or less	Some college (0–15 credits)	Some college (16–40 credits)	Some college (above 40 credits)	Associate's degree or certificate	Bachelor's degree	Advanced degree
				Males			
Total	$21,769	$24,782	$23,835	$24,247	$24,992	$29,728	$29,934
Race ethnicity							
White	22,699	25,836	24,837	24,349	25,053	30,001	29,902
Black	18,397	—	19,719	22,325	23,286	26,061	25,972
Hispanic	20,362	23,401	23,521	21,772	27,758	29,831	26,352
Asian or Pacific Islander	—	—	—	—	—	31,542	38,555
Native Americans	—	—	—	—	—	—	—
Family income in 1980							
$0–14,999	19,147	19,294	21,773	23,374	23,217	27,893	21,205
$15,000–24,999	21,941	23,458	22,111	20,062	24,493	29,353	29,839
$25,000–39,999	23,865	24,869	25,986	22,674	24,352	29,020	27,308
$40,000 or more	28,307	33,264	27,013	31,512	28,363	32,224	33,249
Parent's education attainment							
No college	21,931	23,311	24,018	22,446	25,085	29,260	28,773
Some college/associate's degree	22,549	23,328	22,550	26,394	24,765	29,550	29,329
Bachelor's degree or higher	22,669	28,110	27,310	23,070	24,675	30,133	30,968
				Females			
Total	14,256	18,960	18,431	18,564	20,138	24,150	24,291
Race ethnicity							
White	14,357	18,353	18,193	18,879	20,539	23,864	24,126
Black	14,850	21,435	22,201	16,877	18,130	22,743	23,001
Hispanic	13,107	19,720	15,855	20,658	19,159	24,725	28,230
Asian or Pacific Islander	—	—	—	—	—	27,322	27,270
Native American	—	—	—	—	—	—	—
Family income in 1980							
$0–14,999	13,293	17,087	17,921	17,295	16,846	22,275	25,295
$15,000–24,999	13,779	17,584	16,705	18,958	20,921	23,017	21,271
$25,000–39,999	16,407	18,993	18,870	18,286	22,606	24,877	25,692
$40,000 or more	17,184	—	21,424	17,386	20,545	25,654	23,835
Parent's education attainment							
No college	13,578	17,616	16,360	18,402	19,989	22,465	25,735
Some college/associate's degree	15,799	19,989	20,257	18,312	18,894	24,692	22,783
Bachelor's degree or higher	16,796	19,524	18,393	16,287	22,929	25,093	24,526

— Sample size too small for reliable estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

High School Experience

High School Academic Preparation: Academic Resources Index

To help understand the relationship between high school academic preparation and attainment and earnings later in life, this analysis employed a variable constructed by Adelman referred to as the Academic Resources Index. The index, (which is based on four criteria: intensity of the high school academic curriculum, high school class rank, high school GPA, and students' score on a composite aptitude test "that can be described as a mini, enhanced SAT"[16]) is indicative of type of rating systems many colleges employ to assess the desirability of admission candidates and to predict a student's capacity to perform in college.

For the sophomore class of 1980, the academic resource index was strongly associated with persistence (as measured by credit production) and attainment. Students who completed a bachelor's degree were more than four times as likely to fall in the top fifth of the index than students at lower levels of attainment (table 4), while students with no college were the most likely to fall in the bottom fifth of the index.

[16]Based on the distribution of index scores, students were grouped into one of three categories: the top 20 percent, the middle 60 percent, and the bottom 20 percent. For a full discussion concerning the development of the academic resource index see Adelman (1999).

Table 4—Percentage distribution of high school academic preparation of 1980 sophomores who graduated from high school in 1982, by level of education attainment in 1992.

	Bottom 20 percent of academic resource index	Middle 60 percent of academic resource index	Top 20 percent of academic resource index
High school diploma only	42.6	55.6	1.8
Enrolled in any postsecondary education total	9.8	60.3	29.9
Some college (0–15 credits)	24.2	70.5	5.3
Some college (16–40 credits)	16.8	73.7	9.5
Some college (above 40 credits)	9.5	69.9	20.6
Students with some college total	16.7	71.5	11.9
Associate's degree or certificate	16.9	73.4	9.8
Bachelor's degree	1.5	49.8	48.7
Advanced degree	0.3	35.9	63.8

NOTE: Row percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Comparative Earnings by High School Academic Performance

High school academic preparation was associated with earnings for students at several different levels of attainment. Male and female students who completed a bachelor's degree and fell in the top fifth of the academic resource index had higher earnings than their male and female counterparts who fell in the middle 60 percent of the index (table 5). Similarly, male students with some college who completed 16 to 40 credits and fell in the middle 60 percent of the index had higher earnings than students with the same attainment who fell in the bottom 20 percent of the index.[17]

[17]In most cases, it was not possible to compare differences in earnings for students in the top and bottom 20 percent of the academic resource index due to insufficient sample size.

Table 5—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, by high school academic preparation, by level of education attainment in 1992, and by gender.

	Bottom 20 percent of academic resource index	Middle 60 percent of academic resource index	Top 20 percent of academic resource index
		Males	
High school diploma only	$20,748	$22,868	—
Enrolled in any postsecondary education total	21,794	25,872	$30,287
Some college (0–15 credits)	18,807	26,679	—
Some college (16–40 credits)	20,329	24,883	23,284
Some college (above 40 credits)	—	26,266	21,290
Associate's degree or certificate	25,748	23,875	28,298
Bachelor's degree	—	27,495	32,328
Advanced degree	—	26,278	30,941
		Females	
High school diploma only	14,814	14,360	—
Enrolled in any postsecondary education total	18,834	20,183	25,070
Some college (0–15 credits)	18,428	17,834	—
Some college (16–40 credits)	16,744	18,127	—
Some college (above 40 credits)	—	17,964	17,792
Associate's degree or certificate	17,947	20,661	20,601
Bachelor's degree	—	22,317	26,204
Advanced degree	—	20,956	26,208

— Sample size too small for reliable estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Postsecondary Education Experience

In this section of the analysis, five aspects of postsecondary experience were considered for their possible association with attainment and earnings including college aspirations, type of institution attended, academic focus (liberal arts versus vocational), depth versus breadth of curriculum and grades.[18]

Educational Aspirations

Educational aspirations are not only a measure of students' motivation to attend college, but potentially of career motivation as well. Aspirations may also reflect differences in academic preparation, family background, or choice of institution as well as career interests. For the sophomore class of 1980, educational attainment was closely associated with aspirations. Students with the highest attainment (i.e., graduate degrees) reported the highest aspirations, while those with the lowest attainment (high school or less) reported the lowest aspirations (table 6).

[18]Pascarella and Terenzini (1991) devote a chapter to the subject of economic returns with particular attention to so-called between- and within-college effects. For a more recent example of how institutional characteristics have been treated, see Hoxby and Long (1999).

Table 6—Percentage distribution of 1980 sophomores who graduated from high school in 1982, by educational aspirations in 1982, and by level of education attainment in 1992.

	Educational Aspirations in 1982				
	High school Graduate or less	Two years or less of vocational	Less than four years of college	Bachelor's Degree	Advanced degree
High school diploma only	51.4	27.8	12.2	5.4	3.2
Enrolled in any postsecondary education total	10.4	13.9	19.7	29.8	26.1
Some college (0–15 credits)	18.7	28.5	26.2	16.4	10.2
Some college (16–40 credits)	7.9	21.2	29.2	25.4	16.3
Some college (above 40 credits)	4.7	12.2	19.3	36.2	27.7
Students with some college total	10.3	20.7	25.0	26.0	18.0
Associate's degree or certificate	10.4	30.4	31.3	15.8	12.2
Bachelor's degree	0.7	2.9	14.1	44.9	37.4
Advanced degree	0.3	0.6	8.0	38.4	52.7

NOTE: Row percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980-92), Data Analysis System.

Comparative Earnings by Educational Aspirations

For students with comparable attainment, there was generally no association between earnings and aspirations. (table 7). One difference of note, however, was found among males with a bachelor's who did not aspire to attend college – and had lower earnings than males with the same attainment who aspired to a bachelor's or graduate degree.

Table 7—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, by educational aspirations in 1982, by level of education attainment in 1992, and by gender.

	Educational Aspirations in 1982				
	High school Graduate or less	Two years or less of vocational	Less than four years of college	Bachelor's Degree	Advanced degree
			Males		
High school diploma only	$21,577	$21,140	$24,521	$21,882	$24,850
Enrolled in any postsecondary education total	23,025	24,337	25,309	28,275	29,704
Some college (0–15 credits)	28,305	27,197	21,479	23,486	19,014
Some college (16–40 credits)	22,488	21,670	23,802	26,075	27,019
Some college (above 40 credits)	18,815	23,255	27,409	23,535	26,045
Associate's degree or certificate	23,018	25,084	25,461	26,973	23,993
Bachelor's degree	18,256	—	26,466	30,381	32,113
Advanced degree	—	—	—	30,172	30,912
			Females		
High school diploma only total	12,997	15,313	16,261	16,432	17,111
Enrolled in any postsecondary education total	18,131	18,431	21,035	22,315	23,501
Some college (0–15 credits)	16,886	22,008	20,374	15,600	—
Some college (16–40 credits)	16,443	16,902	16,331	22,047	19,826
Some college (above 40 credits)	—	—	17,037	18,688	17,876
Associate's degree or certificate	21,700	17,538	21,717	20,071	21,233
Bachelor's degree	—	—	24,771	23,950	25,633
Advanced degree	—	—	26,153	23,223	24,562

— Sample size too small for reliable estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

First Institution Attended

The type of postsecondary institution (level of educational offerings and control) students initially attend potentially reflect differences in curriculum as well as differences in the provision of learning resources (such as instruction, advising, remedial support, or facilities) any or all of which may contribute to attainment and earnings.

Type of institution is also relevant because certain institutional categories account for a disproportionate share of all non-completers (students who leave a postsecondary institution without

attaining a degree or certificate). For the sophomore class of 1980, public two-year colleges represented 40 percent of all students who attended college but nearly 60 percent of all students with college credits but no degree. (table 8).

Table 8—Percentage distribution of 1980 sophomores who graduated from high school in 1982 and enrolled in postsecondary education, by type and control of first institution attended, and by level of education attainment in 1992.

	Public two-year or less	Public four-year	Private, not-for-profit less than four-year	Private, not-for-profit four-year	Private for-profit two-year or less	Private for-profit four-year
Total	40.0	35.1	2.1	16.6	5.7	0.5
Education attainment						
Some college (0–15 credits)	74.8	15.8	1.9	4.6	3.0	0.1
Some college (16–40 credits)	59.8	26.2	1.6	7.5	4.9	0.0
Some college (above 40 credits)	36.5	42.8	2.6	14.9	1.8	1.2
Students with some college total	57.6	27.9	2.0	8.8	3.3	0.4
Associate's degree or certificate	59.6	11.9	4.7	3.9	19.1	0.8
Bachelor's degree	18.0	52.9	0.9	27.2	0.7	0.3
Advanced degree	10.4	53.6	0.5	34.9	0.2	0.4

NOTE: Row percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

At the same time the number of credits completed by students with some college varied by type of initial institution. Students who earned 15 or fewer credits, were more likely to have attended a public two-year institution than students who completed more than 40 credits, and students with more than 40 credits were more likely to have attended a public four-year institution or private, not-for-profit four-year institution than those with fewer credits.

Comparative Earnings by Initial Institution Attended

For students with comparable attainment, there was generally no association between earnings and type of institution attended (table 9). While students with comparable attainment, in general, had comparable earnings, males and females who began college at a public two-year public college and subsequently completed a bachelor's degree (e.g., students who transferred to a four-year college) had lower earnings than students with a bachelor's degree who began college at a four-year institution.

Table 9—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982 and enrolled in postsecondary education, by type and control of first institution attended, by level of education attainment in 1992, and by gender.

	Public two-year or less	Public four-year	Private, not-for-profit four-year
		Males	
Total	$24,717	$28,512	$29,702
Education attainment			
Some college (0–15 credits)	26,080	23,244	—
Some college (16–40 credits)	22,455	26,345	—
Some college (above 40 credits)	26,217	22,344	27,905
Associate's degree or certificate	24,211	27,419	—
Bachelor's degree	26,075	30,574	31,200
Advanced degree	25,064	30,392	30,543
		Females	
Total	19,795	22,809	23,754
Education attainment			
Some college (0–15 credits)	19,528	17,817	—
Some college (16–40 credits)	19,596	17,841	14,303
Some college (above 40 credits)	17,864	19,556	19,097
Associate's degree or certificate	20,142	22,321	17,753
Bachelor's degree	20,387	24,840	24,434
Advanced degree	21,190	22,883	28,028

— Sample size too small for reliable estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980-92), Data Analysis System.

Academic Focus: Vocational Versus General Education or Incidental Courses

To help understand the association between course content, attainment, and earnings, an academic focus variable was constructed that classified students based on whether the majority of credits they completed were vocational, general education, or recreational/incidental in nature. Because this variable was constructed at the course level, it was possible for students to have majored in a subject generally regarded as nonvocational (e.g., history) but still have completed a majority of their credits in courses that were classified as vocational (e.g., computer programming). As a result, nearly all fields of study included students from all three classifications. To illustrate, table 10 shows the distribution of students by academic major and academic focus.[19]

[19] A detailed discussion of the construction of the academic focus variable is given in Appendix B (see "Acfocus").

Table 10—Percentage distribution of 1980 sophomores who graduated from high school in 1982, by academic focus, and by undergraduate major.

	Vocational focus	General education focus	Incidental focus
Total	36.2	62.9	1.0
Undergraduate major			
Clerical and office administration	82.2	16.8	1.1
Architecture or environmental design	24.5	75.5	0.0
Film, fine and performing art	5.9	93.0	1.0
Biological sciences	8.8	90.9	0.3
Business administration and management	42.4	55.4	2.3
Communications	18.1	81.3	0.6
Communication technology	—	—	—
Computer and information science	51.5	47.5	1.0
Consumer services	79.9	15.6	4.5
Graphic or industrial design	6.4	93.6	0.0
Textiles/fashion	—	—	—
Education	1.9	95.9	2.2
English or American literature	2.7	95.9	1.4
Engineering	61.7	37.8	0.5
Allied health: general and other	34.5	63.0	2.5
Dentistry, medicine and nursing	20.1	79.5	0.3
Health related technicians	48.8	49.5	1.6
Home economics	52.2	47.8	0.0
Foreign language	1.2	98.3	0.5
Law	9.2	90.8	0.0
Liberal or general studies	12.9	86.2	1.0
Library or archival science	—	—	—
Mathematics	4.3	95.7	0.0
Marketing and distribution	66.7	32.2	1.2
Agriculture and resource management	54.4	45.7	0.0
Philosophy	0.2	99.8	0.0
Physical science	8.5	88.4	3.1
Precision production	85.3	14.3	0.4
Protective services	7.2	92.0	0.8
Social work or social service	3.8	96.2	0.0
Social science	0.8	98.0	1.3

— Sample size too small for reliable estimate.

NOTE: Academic focus was created for this study as a curriculum content variable based on which of the three course categories: vocational (such as hotel management or plumbing), general education (such as biology, social sciences or literature); or incidental (such as Yoga or varsity athletics) accounted for the largest share of credits earned. For a more complete discussion of academic focus see Appendix B variable glossary.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

There were some associations between education attainment and academic focus. For example, students with some college who completed 15 or fewer credits, and students with an associate's degree were more likely than students at other levels of attainment to have had a vocationally oriented curriculum (table 11). Students with some college who completed 40 or more credits and students with a bachelor's or graduate degree were more likely than those with an associate's degree or those with 15 or fewer credits to have had a general education focus.

Table 11—Percentage distribution of 1980 sophomores who graduated from high school in 1982 and enrolled in postsecondary education, by undergraduate academic focus and by level of education attainment in 1992.

	Vocational focus	General education focus	Incidental focus
Total	36.2	62.9	1.0
Education attainment			
Some college (0–15 credits)	46.1	52.1	1.8
Some college (16–40 credits)	27.0	70.5	2.6
Some college (above 40 credits)	18.2	81.5	0.3
Students with some college total	30.5	67.9	1.6
Associate's degree or certificate	66.9	32.7	0.4
Bachelor's degree	25.0	74.0	1.0
Advanced degree	23.6	76.1	0.4

*Based on the dominant number of courses student completed.

NOTE: Academic focus was created for this study as a curriculum content variable based on which of the three course categories: vocational (such as hotel management or plumbing), general education (such as biology, social sciences or literature); or incidental (such as Yoga or varsity athletics) accounted for the largest share of credits earned. For a more complete discussion of academic focus see Appendix B variable glossary. Row percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Comparative Earnings by Academic Focus

While average earnings varied by academic focus, these differences were not consistent across levels of attainment. Among students with some college who completed more than 40 credits, males with a general education focus had higher earnings than males with a vocational focus (table 12). In contrast, among students with a bachelor's or graduate degree, males with a vocational focus had higher earnings than males with a general education focus. Finally, despite

the strong vocational orientation typically associated with two-year programs, there was no difference in earnings by academic focus for males or females with an associate's degree.[20]

Table 12—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982 and enrolled in postsecondary education, by undergraduate academic focus, by level of education attainment in 1992, and by gender.

	Vocational focus	General education focus
	Males	
Total	$27,979	$26,409
Education attainment		
Some college (0–15 credits)	28,295	21,743
Some college (16–40 credits)	21,882	25,142
Some college (above 40 credits)	19,911	25,085
Associate's degree or certificate	25,054	24,982
Bachelor's degree	31,664	28,844
Advanced degree	36,657	26,877
	Females	
Total	21,239	21,709
Education attainment		
Some college (0–15 credits)	21,145	16,863
Some college (16–40 credits)	17,573	18,788
Some college (above 40 credits)	16,934	19,097
Associate's degree or certificate	20,500	19,493
Bachelor's degree	24,120	24,243
Advanced degree	26,961	23,706

NOTE: Academic focus was created for this study as a curriculum content variable based on which of the three course categories: vocational (such as hotel management or plumbing), general education (such as biology, social sciences or literature); or incidental (such as Yoga or varsity athletics) accounted for the largest share of credits earned. For a more complete discussion of academic focus see Appendix B variable glossary.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Program Concentration: Depth Versus Breadth of Curriculum

While undergraduate curricula are designed to achieve both breadth of knowledge and mastery in a particular subject,[21] students normally exercise considerable latitude in the selection of individual courses. As a result, most students face a tradeoff concerning the "depth versus

[20]For female students with comparable levels of education attainment, there was no significant difference in earnings by academic focus (1.64, .65, 1.08, .76, .11, 1.59).

[21]See, for example, *An Overview of Accreditation* on North Central Association Commission on Institutions of Higher Education's website—www.ncacihe.org.

breadth" of their curriculum with potential bearing on earnings later in life. On the one hand, too much specialization may fail to prepare students with the capacity to adapt to labor market demands outside their immediate knowledge. On the other hand, too much breadth may come at the expense of acquiring the necessary skills and knowledge required for entry into a specific field of employment.

To help explore the relationship between depth versus breadth of curriculum and attainment and earnings, a concentration index was constructed to measure the dispersal of courses students completed by academic subject. The index was based on an algorithm known as the Hirschman-Herfindahl concentration index, which has been used in numerous other applications from measuring racial segregation to industrial concentration.[22]

The values generated by this index represent an *equivalency* of the number of subjects studied at the undergraduate level and range from an index score of 1, which would indicate that all coursework was taken within a single subject area, to a score of N which would indicate a breadth of coursework equivalent to the total number of subjects offered.

On average, students studied the equivalent of about six subjects as undergraduates. With the exception of students who completed fifteen or fewer credits, students with a general education focus studied a greater breadth of subjects than students with a vocational focus. In addition, among students who had a general education focus, those with some college who completed more than 40 credits studied a greater breadth of subjects than students who completed a bachelor's or advanced degree.[23]

[22]For a brief overview, see Bannock, Baxter, and Rees (1972).

[23] In part, this dispersal of courses may help explain why some students at this level of attainment may have failed to complete a degree program despite a demonstrated capacity to perform academically.

Table 13—Percentage distribution of 1980 sophomores who graduated from high school in 1982 and enrolled in postsecondary education, by breadth of subjects index, by undergraduate academic focus, and by level of education attainment in 1992.

	Breadth of Subjects Index				
	Four or less	Five to six	Seven to eight	Nine or more	Mean index score
Total	48.0	15.0	31.3	5.7	5.7
			Vocational focus		
Education attainment					
Some college (0–15 credits)	74.8	19.7	5.6	0.0	4.3
Some college (16–40 credits)	51.7	37.9	7.9	2.5	5.0
Some college (above 40 credits)	38.8	34.7	21.6	4.9	5.4
Associate's degree	49.9	29.9	16.6	3.6	5.1
Bachelor's degree	43.0	31.4	15.3	10.3	5.5
Advanced degree	49.9	32.7	13.4	4.3	5.0
			General education focus		
Education attainment					
Some college (0–15 credits)	63.9	25.6	10.2	0.3	4.6
Some college (16–40 credits)	28.9	34.9	27.4	8.8	6.0
Some college (above 40 credits)	3.4	16.7	30.8	49.2	8.8
Associate's degree	13.1	21.7	25.0	40.2	7.7
Bachelor's degree	10.8	21.2	31.4	36.7	7.8
Advanced degree	19.3	27.6	23.0	30.1	7.0

NOTE: Breadth of the subjects studied was based on the concentration of courses completed across the range of course offerings by CIP code. Row percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980-92), Data Analysis System.

Comparative Earnings by Program Concentration

Although program concentration in several instances was associated with differences in earnings, these differences were not consistent across levels of attainment or by gender (table 14). For instance, among students with a bachelor's degree, males in the middle bands of the index (the equivalent of five to eight subjects) had higher earnings than males in the top band (nine or more subjects). By contrast, among students with an advanced degree, males in the bottom band (the equivalent of four or fewer subjects) had higher earnings than males who studied the equivalent of seven or eight subjects while females in the bottom band had higher earnings than females in the top band.

Table 14—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982 and enrolled in postsecondary education, by breadth of subjects index, by level of education attainment in 1992, and by gender.

	Breadth of Subjects Index			
	Four or less	Five to six	Seven to eight	Nine or more
		Males		
Total	$27,823	$27,368	$28,365	$26,170
Education attainment				
Some college (0–15 credits)	23,254			
Some college (16–40 credits)	23,252	21,461	26,450	
Some college (above 40 credits)		23,743	23,653	26,935
Associate's degree	25,836	21,791	27,298	25,055
Bachelor's degree	29,235	31,142	31,892	26,455
Advanced degree	35,553	31,573	28,186	24,188
		Females		
Total	21,140	23,666	23,270	20,325
Education attainment				
Some college (0–15 credits)	16,536			
Some college (16–40 credits)	16,350	21,185	16,877	
Some college (above 40 credits)		16,591	23,108	17,113
Associate's degree	19,650	22,662	21,402	18,643
Bachelor's degree	25,300	24,829	25,397	21,932
Advanced degree	28,012	26,117	23,967	20,941

Sample size too small for reliable estimate.

Note: Based on the concentration of courses completed across range of CIP course categories.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Grades in College

College GPAs represent a fundamental measure of academic performance, reflecting not only cognitive gains but, more broadly a student's integration into college life and capacity to avail themselves of their learning environment. In addition to serving as an effective predictor of retention and attainment, college grades also serve as an important screening mechanism for additional education or employment.[24]

For the sophomore class of 1980, students with a graduate or bachelor's degree had higher GPAs than did students at lower levels of attainment (table 15). Similarly, students from two-

[24]In this analysis, students were grouped into four categories of undergraduate GPAs for all students. To allow for potential differences in grading standards across different types of institutions, the distribution of GPA scores were tabulated separately by educational sector of initial institution.

and four-year public institutions with an associate's degree (on average) had higher GPAs than students with some college but no degree.

At public four-year institutions, about one-third of all students with 15 or fewer credits had GPAs of 2.0 or higher, compared with about 80 percent of all students with an associate's degree and more than 95 percent of all students with a bachelor's degree. There appeared to be the same pattern with private, not-for-profit four-year institutions, but the only significant difference was between students with 15 or fewer credits and those with a bachelor's degree.

Table 15—Percentage distribution of 1980 sophomores who graduated from high school in 1982 and enrolled in postsecondary education, by cumulative undergraduate GPA and mean cumulative undergraduate GPA, by type and control of first institution attended, and by level of education attainment in 1992.

	GPA less than 2.0	GPA 2.0 to 2.49	GPA 2.5 to 2.99	GPA 3.0 and above	Mean GPA
Total	16.2	19.7	28.8	35.3	2.62
			Public 2-year		
Education attainment					
Some college (0–15 credits)	36.5	17.0	14.4	32.1	2.27
Some college (16–40 credits)	26.8	24.6	24.3	24.3	2.39
Some college (above 40 credits)	22.5	26.9	29.9	20.7	2.47
Associate's degree	12.4	23.3	27.6	36.8	2.64
Bachelor's degree	2.1	20.1	37.3	40.5	2.83
Advanced degree	0.0	6.5	37.1	56.4	3.04
			Public 4-year		
Education attainment					
Some college (0–15 credits)	63.9	18.2	3.7	14.2	1.63
Some college (16–40 credits)	51.0	24.7	13.6	10.7	1.99
Some college (above 40 credits)	37.0	34.9	20.6	7.5	2.16
Associate's degree	20.3	26.0	28.0	25.7	2.49
Bachelor's degree	3.0	19.2	40.2	37.6	2.80
Advanced degree	0.8	6.8	38.5	53.9	3.01
			Private, not-for-profit 4-year		
Education attainment					
Some college (0–15 credits)	51.8	0.8	1.4	45.9	2.09
Some college (16–40 credits)	45.3	17.6	19.0	18.1	2.25
Some college (above 40 credits)	27.6	41.9	14.6	15.9	2.31
Associate's degree	19.7	26.3	34.3	19.7	2.46
Bachelor's degree	3.6	19.6	38.9	37.9	2.82
Advanced degree	0.4	2.6	29.5	67.4	3.14

NOTE: Row percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Comparative Earnings by College GPA

With the exception of students with a bachelor's degree, undergraduate GPAs were not associated with earnings (table 16). For students with a bachelor's degree, however, males with a GPA of less than 2.0 had lower earnings than males with a GPA of 2.0 or higher. Similarly females with a bachelor's degree and a GPA of between 2.0 and 2.99 had lower earnings than females with a GPA of 3.0 or higher.

Table 16—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982 and enrolled in postsecondary education, by cumulative undergraduate GPA, by level of education attainment in 1992, and by gender.

	GPA less than 2.0	GPA 2.0 to 2.49	GPA 2.5 to 2.99	GPA 3.0 and above
		Males		
Total	$24,031	$25,696	$27,765	$28,613
Education attainment				
Some college (0–15 credits)	21,350	25,932	—	29,725
Some college (16–40 credits)	24,711	24,357	22,525	23,164
Some college (above 40 credits)	27,371	23,174	23,657	20,184
Associate's degree	24,163	23,646	25,433	25,823
Bachelor's degree	22,099	28,622	30,019	31,243
Advanced degree		24,193	29,844	30,568
		Females		
Total	18,384	19,279	22,773	22,605
Education attainment				
Some college (0–15 credits)	20,372	18,562	14,907	19,015
Some college (16–40 credits)	18,109	16,907	20,640	18,752
Some college (above 40 credits)	17,779	18,337	20,953	16,994
Associate's degree	16,243	18,929	22,940	19,946
Bachelor's degree		21,159	24,846	24,846
Advanced degree		22,283	21,331	26,210

— Sample size too small for reliable estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980-92), Data Analysis System.

Early Work Experiences

Early work experiences are potentially associated with later life career development and earnings in a number of ways. Such experiences may contribute to the acquisition of foundational skills and may also reflect differences in student motivation in general or interest in employment in particular. Early work experiences may also play an important role in the formation of career-related goals and aspirations. For most students, early work experiences accrue concurrently with education and often serve to enrich aspects of the academic experience. For students who do not attend college, the environment of work in many cases constitutes the primary mechanism through which new skills and knowledge are acquired. In other words, for students who do not attend college, work may be pursued not only for economic reasons, but also for learning new skills (i.e., as an alternative to postsecondary education).

Employment While in High School: The High School Job Index

To help explore the relationship between high school employment, attainment, and earnings, a high school job index was constructed. The index was based on the incidence of employment and average weekly hours worked during the sophomore and senior school year and during the summers after the sophomore and senior year. Students were then grouped into thirds based on the overall distribution of index scores.[25]

As measured by the high school job index, work experiences did not vary by level of attainment, with the exception of students with no college, who were more likely to fall in the bottom third of the High School Job Index than students at all higher levels of attainment (table 17). In part, this observation may reflect differences in student access to work opportunities as well as differences in student motivation.[26]

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[25]See Appendix C for a more detailed discussion of the high school job index "Schjobgp."

[26] While the association between academic preparation and high school work experiences suggests that student motivation is likely to be a contributing factor behind student employment, differences in work experience by social and demographic background also suggest that access to employment opportunities is likely to be a contributing factor as well. Consider, for example, that national youth unemployment rates through out most of the 1980s were nearly three times higher for black students as for white students.

Table 17—Percentage distribution of 1980 sophomores who graduated from high school in 1982, by high school job index and by level of education attainment in 1992.

	High School Job Index		
	Low job experience	Middle job experience	High job experience
High school diploma only	43.9	21.0	35.1
Enrolled in any postsecondary education total	28.2	30.2	41.6
Some college (0–15 credits)	32.6	22.3	45.1
Some college (16–40 credits)	28.5	28.3	43.2
Some college (above 40 credits)	29.5	28.8	41.7
Students with some college total	30.1	26.5	43.4
Associate's degree	30.7	28.0	41.3
Bachelor's degree	25.7	33.4	40.9
Advanced degree	24.3	36.6	39.1

NOTE: Row percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Comparative Earnings by High School Job Experience

For males with no college, students in the top third of the high school job index had higher earnings than students in the bottom third (table 18). In certain instances, after considering high school job experiences, students at different levels of attainment had the same earnings. For example, among students in the top third of the high school job index, males with an associate's degree had earnings similar to those of males at all lower levels of attainment. Likewise, among students in the bottom third of the index, females with a bachelor's degree had earnings similar to those of females with some college who completed more than 40 credits.

Table 18—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, by high school job index, by level of education attainment in 1992 and by gender.

	High School Job Index		
	Low job experience	Middle job experience	High job experience
		Males	
High school diploma only	$19,852	$19,538	$24,396
Enrolled in any postsecondary education total	24,175	26,470	27,478
Some college (0–15 credits)	21,513	27,758	25,329
Some college (16–40 credits)	20,658	22,386	26,159
Some college (above 40 credits)	22,241	21,235	26,137
Associate's degree or certificate	24,636	23,113	25,995
Bachelor's degree	29,023	30,304	29,708
Advanced degree	28,723	30,600	30,041
		Females	
High school diploma total	13,525	13,819	15,665
Enrolled in any postsecondary education total	18,601	21,385	22,231
Some college (0–15 credits)	18,978	17,303	20,236
Some college (16–40 credits)	17,955	17,968	19,161
Some college (above 40 credits)	19,938	17,064	18,567
Associate's degree or certificate	17,253	20,528	21,791
Bachelor's degree	22,433	23,853	25,880
Advanced degree	22,401	24,934	24,770

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980-92), Data Analysis System.

Early Work Experience: The Early Work Index

To help explore the relationship between early work involvement and attainment and earnings, an early work index was constructed to reflect the intensity and continuity of work experiences from 1983 to 1986.[27] The index was based on the cumulative months of employment over the four-year period, average annual job tenure (defined as total number of months divided by the number of employers per year) and average annual earnings.[28]

In general, work involvement (as measured by the index) decreased with attainment, in large part reflecting the time tradeoff that students face to pursue both academic and work activities. In the four years after high school (1983 to 1986), students who did not attend college and students who completed 40 or fewer credits were more likely to fall in the top third of the early work index than students with a bachelor's or graduate degree (table 19). Conversely, students with a bachelor's or graduate degree were the most likely to fall in the bottom third of the index.

Table 19—Percentage distribution of 1980 sophomores who graduated from high school in 1982, by early work experience (1983–86), and by level of education attainment in 1992.

	Early Work Index		
	Low work experience	Middle work experience	High work experience
High school diploma only	22.6	35.3	42.1
Enrolled in any postsecondary education total	41.1	32.9	26.0
Some college (0–15 credits)	20.8	37.7	41.5
Some college (16–40 credits)	22.5	35.9	41.6
Some college (above 40 credits)	33.2	38.3	28.6
Students with some college total	25.2	37.2	37.6
Associate's degree or certificate	38.5	35.2	26.3
Bachelor's degree	54.9	27.6	17.5
Advanced degree	55.1	29.8	15.1

NOTE: Row percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Comparative Earnings by Early Work Experience

Among students with comparable attainment, there were several instances in which students in the top third of the early work index had higher earnings than their counterparts in the

[27] In considering the early work index, it is important to recognize that this variable does not distinguish between work experience acquired while still in school from work experience acquired after leaving school. While this distinction may have bearing on students' earnings later in life, , a later work index (e.g. 1987-1990) will in many instances be based on information concerning the same position students had in 1991 — the year used in this analysis to compare earnings.

[28] Following construction of the index, males and females were grouped into thirds based on the overall distribution of scores for their respective gender. A more detailed discussion of the early work index is given in Appendix C ("LFIA").

bottom third (table 20). These included males with a graduate degree, males with some college who completed 15 or fewer credits, males with no college and females with no college.

At the same time, in certain instances, after considering early work experiences, students at different levels of attainment had the same earnings. For example, among students in the top third of the early work index, males or females with an associate's degree had similar earnings compared with males or females with bachelor's degrees; and males who did not attend or complete college had similar earnings as males with an associate's degree. In addition, males with no college in the top third of the index had higher earnings than males in the bottom third who completed 15 or fewer credits.

Table 20—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, by early work experience (1983–86), by level of education attainment in 1992, and by gender.

	Early Work Index		
	Low work experience	Middle work experience	High work experience
		Males	
High school diploma only	$15,509	$20,612	$25,332
Enrolled in any postsecondary education	24,843	26,597	28,950
Some college (0–15 credits)	15,854	22,585	30,980
Some college (16–40 credits)	23,043	23,222	24,822
Some college (above 40 credits)	21,292	22,848	30,701
Associate's degree or certificate	23,382	24,953	27,042
Bachelor's degree	28,647	31,064	30,893
Advanced degree	28,131	28,578	36,249
		Females	
High school diploma total	12,968	13,582	15,916
Enrolled in any postsecondary education	21,450	20,447	20,508
Some college (0–15 credits)	16,870	20,342	18,374
Some college (16–40 credits)	15,372	19,735	19,080
Some college (above 40 credits)	19,499	18,678	17,030
Associate's degree or certificate	18,732	20,794	21,886
Bachelor's degree	24,290	23,660	24,942
Advanced degree	24,373	23,940	24,926

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Controlling for Related Variables

Each of the variables discussed in this report illustrates how factors other than education attainment are potentially associated with student earnings. Thus far, each variable has been considered separately. However, several of the variables may be related to one another and to other background characteristics as well. For example, parent education attainment may not only play a role in a student's high school academic preparation but may be associated with college aspirations or early work experiences as well. To determine the influence of each variable on student earnings while controlling for the interrelationship among variables, this analysis makes use of linear regression analysis (see appendix C for details about the methods used) to produce adjusted means.

The regression analysis included students at all levels of attainment and uses annual earnings in 1991 as the dependent variable.[29] Each of the model's independent variables were entered as dummy variables derived from the student characteristics discussed in this analysis including:

Gender
Ethnic/racial group
Family income in 1980
Parent education attainment

High school academic preparation
Educational aspirations
Type of initial institution attended
Academic focus
Depth versus breadth of curriculum
Undergraduate GPA

Employment experience while in high school
Early work experience 1983–1986

In addition to the parameters listed above, dummy variables were included for high school extra-curricular involvement and timing of entry into college[30], along with two control variables

[29]As with all of the descriptive tables on mean earnings, the regression models excluded students with zero earnings. In addition, a single record reporting annual earnings of $1.5 million was also excluded.

to help account for variance in earnings that might otherwise be attributed to education attainment. These control variables included a dummy variable indicating that a student was not enrolled in college while employed during 1991; and a dummy variable indicating that a student either had earnings below the 1991 minimum wage level, or worked less than full-time and/or less than full year at minimum wage.[31]

The results of the regression analysis are shown in table 21. The first column of the table shows the unadjusted average earnings for each variable—which represents the average earnings of all students with that characteristic before controlling for other variables in the model. The second column displays the corresponding adjusted average, for which the variation of all other variables has been controlled. The italicized row is the comparison group for significance testing and asterisks indicate instances where the average earnings for a specific row is significantly different from the comparison group within the row category.

To illustrate, the average earnings for students from families where neither parent had attended college was $20,426, compared with $24,978 for students from families where one or both parents completed at least a bachelor's degree. In part, the lower earnings of this group may be directly associated with differences in parental education attainment (through, for example, their capacity to help students secure employment), but lower earnings may also reflect differences in high school academic preparation, college participation or early work experiences as well, which may also be associated with parent education attainment. After controlling for the covariance among all the variables, the adjusted mean earnings for students from families where neither parent attended college increased (to $21,868), while the adjusted earnings of students whose parents had a bachelor's degree or higher decreased (to $21,760). As a result, when the adjusted means for both groups of students were compared, there was no longer an association between parent attainment and earnings. In other words, the differences in unadjusted means were the result of other associated factors.

After taking into account all of the factors considered in this analysis, students' education attainment remains as a significant variable with differences in earnings observed across several

[30] High school extra-curricular involvement was included an independent variable because of the potential role of such activities in the acquisition of skills, knowledge and experiences that may contribute directly or indirectly to attainment and earnings. Timing of entry into college was similarly considered – particularly with respect to attainment. Delayed entry, for example, may indicate a lack of interest in college, insufficient academic preparation, inadequate financial resources or other competing responsibilities such as parenthood, employment or military service. Definitions for each of the variables are given in Appendix B and summary statistics can be found in Appendix tables A1–A4.

[31] In the absence of information about average weekly hours of employment or number of weeks worked annually, these two variables represent potentially important surrogates of labor force involvement. Summary statistics showing the incidence of students not enrolled in college and the average earnings of those enrolled and not enrolled in college are presented in Appendix tables A5 and A6. Summary statistics showing the incidence of students with earnings below the 1991 minimum wage level, or who worked less than full-time and/or less than full year at minimum wage are given in Appendix table A7.

levels of attainment (see page two of table). Students with a bachelor's or graduate degree, for example, had higher earnings than students with no college, as did students with an associate's degree. For students with some college, however, there was no difference in earnings compared with students with no college.

Table 21—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, and the adjusted mean earnings after taking into account the covariation of the variables listed in the regression model.

	Unadjusted average[1]	Adjusted average[2]	Least squares coefficient[3]	Standard error[4]
Total	$22,033	$22,033	$17,057	$1,636
Gender				
Female	19,018*	19,836*	-4,104	511
Male	*24,650*	*23,940*	†	†
Race/ethnicity				
White	*22,581*	*21,937*	†	†
Black	19,278*	21,798	-139	813
Hispanic	20,422*	22,880	943	938
Asian or Pacific Islander	26,719*	24,742	2,804	2,333
Native American	20,038	22,798	861	2,365
Family income in 1980				
$0–14,999	*18,926*	*20,803*	†	†
$15,000–$25,999	21,587*	21,047	244	712
$25,000–$39,999	23,784*	22,444*	1,641	716
$40,000 or more	26,366*	24,173*	3,370	835
Parent educational attainment				
High school or less	*20,426*	*21,882*	†	†
Two-year degree or some college	22,457*	22,522	640	603
Four-year degrees or higher	24,978*	21,760	-122	703
High school academic preparation[5]				
Lowest	*18,653*	*21,133*	†	†
Middle	21,512*	21,677	544	684
Highest	27,856*	23,901*	2,768	984
Postsecondary aspirations in 1982				
No postsecondary aspirations	*18,997*	*20,970*	†	†
Vocational degree	19,908	20,869	-101	786
Associate's degree	21,949*	22,759*	1,789	858
Bachelor's degree	24,719*	22,537	1,566	926
Advanced degree	26,592*	23,710*	2,739	1,019

Table 21—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, and the adjusted mean earnings after taking into account the covariation of the variables listed in the regression model—Continued.

	Unadjusted average[1]	Adjusted average[2]	Least squares coefficient[3]	Standard error[4]
Sector of postsecondary institution				
Public Two-year or less	*$21,960*	*$21,407*	†	†
Public Four-year	21,614	21,998	$592	$703
Private, not-for-profit less than Four-year	25,431	22,298	891	1,740
Private, not-for-profit Four-year	26,871*	23,389*	1,982	886
Private for-profit Two-year or less	21,816	22,843	1,436	1,249
Private for-profit Four-year		25,127	3,721	4,002
Undergraduate GPA				
Less than 2.00	*20,994*	*20,945*	†	†
2.00–2.49	22,999*	21,487	541	852
2.49–2.99	24,822*	22,212	1,266	842
3.00 or higher	25,172*	22,700*	1,754	843
Academic focus				
Vocational education focus	*24,769*	*23,329*	†	†
General education focus	23,411*	21,317*	-2,012	610
Incidental focus	20,290*	20,195	-3,134	2,346
Breadth of subjects index				
Equivalent of 12 subjects	*23,029*	*21,296*	†	†
Equivalent of eight subjects	25,481*	22,871*	1,575	705
Equivalent of six subjects	25,230*	22,216	920	717
Equivalent of four subjects	24,446	21,784	488	766
Educational attainment				
High school or less	*18,848*	*20,125*	†	†
Some college (0–15 credits)	20,654*	22,086	1,961	1,225
Some college (15–40 credits)	20,816*	21,348	1,224	1,181
Some college (above 40 credits)	21,381*	21,998	1,873	1,182
Associate's degree or certificate	21,473*	21,958*	1,833	848
Bachelor's degree	27,029*	24,751*	4,626	965
Above a bachelor's degree	27,087*	24,094*	3,969	1,259
High school work index				
Lowest involvement	*19,315*	*21,382*	†	†
Middle involvement	21,711*	21,498	115	692
Highest involvement	24,161*	22,831*	1,448	640
Early work index				
Low	*21,282*	*20,225*	†	†
Medium	21,204	21,917*	1,692	597
High	23,932*	24,425*	4,200	649

Table 21—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, and the adjusted mean earnings after taking into account the covariation of the variables listed in the regression model—Continued.

	Unadjusted average[1]	Adjusted average[2]	Least squares coefficient[3]	Standard error[4]
Enrolled in school in fall of 1991				
Not enrolled	*$22,245*	*$22,115*	†	†
Enrolled	19,825*	19,703	$-2,412	$1,357
Full-time full-year at minimum wage				
Less than full-time full-year	3,848*	6,445*	-17,353	824
Full-time full-year	*24,093*	*23,798*	†	†
High school extracurricular involvement				
Lowest	19,067	21,719	-422	756
Middle	21,915*	22,104	-37	598
Highest	*23,542**	*22,141*	†	†
Delay of college entry				
Enter college within 12 months	*24,444*	*22,160*	†	†
Enter college after 12 months	20,834*	21,617	-543	641

*$p \leq .05$.
†Not applicable for the reference group
[1]HSB: 80-94 Data Analysis System. The italicized group in each category is the reference group for comparisons.
[2]Adjusted for differences associated with other variables in the table (see Appendix C).
[3]Least squares regression coefficient (see Appendix C).
[4]Standard error of LS coefficient, adjusted for design effect (see Appendix C).
[5]Academic resources index.

Additionally, after controlling for other factors, there were no differences in student earnings associated with race/ethnicity, high school extracurricular involvement, or timing of entry into college. On the other hand, the remaining variables in the model were all associated with higher earnings. Figure 2 summarizes the principal findings from the multivariate analysis.

Figure 2—Summary of findings from regression analysis based on adjusted mean earnings

Demographic and family background	High school experience and preparation	Postsecondary experience	Early work experience
Race — no difference in earnings by race *Gender* — females had lower earnings than males after controlling for all other factors in the model *Family income in 1980* — students from families with 1980 incomes of $25,000 and above had higher earnings than students from families with incomes under $15,000. *Parent education attainment* — no difference in earnings for students from families where one or both parents had a bachelor's degree or higher compared with students whose parents had an associate's degree, some college or no college.	*Academic preparation* — students in the top quintile of the academic resource index had higher earnings than students in the bottom quintile. *Extra-curricular involvement* — no difference in earnings by student's level of extra-curricular involvement	*College aspirations* — students who aspired to an associate's or advanced degree had higher earnings than students with no postsecondary aspirations. *Timing of entry* — no difference in earnings for students who entered college directly after high school compared with students who waited twelve or more months *Initial type of institution attended* — students who attended a 4-year private, not-for-profit college or university higher earnings than students who attended a public 2-year. *Degree (and credits) completed* — students with an associate's, bachelor's or graduate degree had higher earnings than students with a high school diploma or less. *College GPA* — students with at least a 3.0 had higher earnings than students with less than a 2.0. *Academic focus* — students with a vocational focus had higher earnings than students with a general education focus. *Program Concentration* students with breadth of curriculum equivalent to seven or eight subjects had higher earnings than students with breadth equivalent to nine or more subjects.	*Employment while in high school* — higher earnings for students in the top third of the high school job index compared to lowest. *Early work experience (1983–86)* — higher earnings for students in the middle or top third of the early work index compared to lowest third.

In a second regression model (table 22), a series of dummy variables were included to represent the 10 largest undergraduate academic majors[32]. While the inclusion of these variables slightly improved the total explained variance in earnings, conclusions drawn from the results of the first regression remain generally unchanged with the exception of academic focus, which is no longer significant. Additionally, four of the 10 categories of academic major were significant and all were associated with higher earnings than the "other" group. These majors included business, computer science, engineering, and health technologies.

[32] A student's academic major not only reflects curricular aspects of a college education, such as areas of learning emphasis and academic rigor, but is potentially associated with a student's aptitude and interest in certain fields of study and employment as well. For example, just under half (47.5 percent) of all students from the sophomore class of 1980 who became physicians majored in the biological sciences as an undergraduate. Summary statistics for field of study are presented in Appendix tables A8–A9.

Table 22.—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, and the adjusted mean earnings after taking into account the covariation of the variables listed in the regression model.

	Unadjusted average[1]	Adjusted average[2]	Least squares coefficient[3]	Standard error[4]
Total	$24,086	$22,033	$15,434	$1,704
High school academic preparation[5]				
Lowest	*20,237*	*21,304*	†	†
Middle	22,774*	21,775	471	682
Highest	27,727*	23,460*	2,156	992
Academic focus				
Vocational	*24,651*	*22,811*	†	†
General	23,864*	21,616	-1,194	655
Incidental	19,121*	20,228	-2,583	2,349
High school extracurricular involvement				
Lowest	22,779	21,599	-606	756
Middle	23,842*	22,095	-110	596
Highest	*24,571**	*22,205*	†	†
Postsecondary aspirations in 1982				
No postsecondary aspirations	*20,291*	*21,010*	†	†
Vocational degree	21,264	20,988	-21	787
Associate's degree	22,722*	22,728*	1,718	859
Bachelor's degree	25,086*	22,536	1,526	927
Advanced degree	26,598*	23,545*	2,535	1,020
Enrolled in any postsecondary education				
High school or less	*21,134*	*19,982*	†	†
Some college (0–15 credits)	21,675*	22,204	2,222	1,226
Some college (15–40 credits)	21,281*	21,319	1,337	1,179
Some college (above 40 credits)	21,544*	21,774	1,792	1,182
Associate's degree or certificate	22,267*	21,980*	1,998	872
Bachelor's degree	26,905*	24,850*	4,868	968
Above a bachelor's degree	27,012*	24,512*	4,530	1,267
Family income in 1980				
$0–14,999	*20,939*	20,907	†	†
$15,000–25,999	23,037*	21,004	97	711
$25,000–39,999	24,559*	22,416*	1,509	714
$40,000 or more	27,598*	24,165*	3,259	833
College GPA				
Less than 2.00	*21,375*	*20,894*	†	†
2.00–2.49	22,752*	21,476	582	850
2.49–2.99	25,196*	22,219	1,325	841
3.00 or higher	25,180*	22,724*	1,829	843

Table 22—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, and the adjusted mean earnings after taking into account the covariation of the variables listed in the regression model—Continued.

	Unadjusted average[1]	Adjusted average[2]	Least squares coefficient[3]	Standard error[4]
Early labor force index				
Low	*$23,610*	*$20,310*	†	†
Medium	23,482	21,843*	$1,533	$597
High	25,930*	24,405*	4,095	648
Delay of college entry				
Enter college within 12 months	*24,784*	*22,174*	†	†
Enter college after 12 months	22,060*	21,573	-601	641
Parent educational attainment				
High school or less	*22,636*	*21,868*	†	†
Two-year degree or some college	23,449*	22,509	640	601
Four-year degree or higher	25,968*	21,800	-68	701
Enrolled in school in fall of 1991				
Not enrolled	*24,651*	*22,120*	†	†
Enrolled	19,726*	19,566	-2,554	1,354
Race ethnicity				
White	*24,379*	*21,977*	†	†
Black	21,254*	21,549	-428	813
Hispanic	23,498*	22,871	893	935
Asian or Pacific Islander	28,037*	24,686	2,708	2,326
Native American	22,829	22,779	801	2,357
High school work index				
Did not work in high school	*22,244*	*21,422*	†	†
Worked sophomore-senior years	23,813*	21,533	112	690
Worked extensively sophomore-senior years	25,407*	22,781*	1,359	638
Gender				
Female	21,385*	19,885*	-4,013	561
Male	*26,966*	*23,898*	†	†
Sector of postsecondary institution				
Public two-year or less	*22,104*	*21,324*	†	†
Public four-year	22,090	22,035	711	716
Private, not-for-profit less than four-year	25,661	21,965	640	1,736
Private, not-for-profit four-year	26,662*	23,501*	2,176	898
Private for-profit two-year or less	21,306	23,068	1,744	1,252
Private for-profit four-year		24,728	3,403	3,993

Table 22—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, and the adjusted mean earnings after taking into account the covariation of the variables listed in the regression model—Continued.

	Unadjusted average[1]	Adjusted average[2]	Least squares coefficient[3]	Standard error[4]
Breadth of subjects index				
Equivalent of 12 subjects	*$22,949*	*$21,365*	†	†
Equivalent of eight subjects	25,782*	22,914*	$1,548	$707
Equivalent of six subjects	25,432*	22,194	829	723
Equivalent of four subjects	24,243	21,700	335	775
Full-time full-year at minimum wage				
Less than full time, full year	4,137*	6,588*	-17,194	823
Full time, full year	*25,918*	*23,782*	†	†
Undergraduate major				
All other majors	*23,537*	*20,653*	†	†
Clerical and office administration	18,749*	22,492	1,839	1,234
Business	25,350*	22,909*	2,256	762
Computer science	25,733*	23,247*	2,594	1,028
Education	18,659*	19,133	-1,520	1,201
Engineering	28,010*	23,604*	2,952	1,006
Dentistry, medicine, nursing	22,394	23,126	2,473	1,335
Health technicians	22,434	23,858*	3,205	1,207
Liberal, general studies	20,143*	21,049	396	1,180
Precision production	24,118*	22,299	1,647	1,198
Social science	15,796*	22,343	1,690	1,055

*$p \leq .05$.
†Not applicable for the reference group.
[1]The italicized group in each category is the reference group for comparisons.
[2]Adjusted for differences associated with other variables in the table (see Appendix C).
[3]Least squares regression coefficient (see Appendix C).
[4]Standard error of LS coefficient, adjusted for design effect (see Appendix C).
[5]Academic resources index.

Summary and Conclusions

After adjusting for confounding factors associated with education attainment, the two regression models and resultant adjusted mean earnings support a number of conclusions. To begin, students with a graduate, bachelor's, or associate's degree had higher earnings than those with no college. In contrast with other studies, however, there was no difference in earnings for students with some college credits apart from degree completion after controlling for other aspects of student background.

Based on the ratio of the adjusted means, students with a bachelor's degree earned about 23 percent more than those with no college. For students with an associate's degree, the ratio of adjusted means represented about a nine percent differential compared to those with no college.

While students with some college, on average, had the same earnings as students with a high school diploma, it is possible to define configurations of experience in which students with some college achieved higher earnings than those with no college. For example, students whose college coursework could be characterized as vocational or students with cumulative GPAs of 3.0 or higher had adjusted mean earnings that were $1,754 and $2,012 above their counterparts after controlling for attainment and other related variables.

More generally, the association between students' earnings and such "within-college effects" as type of institution, grades, undergraduate major, academic focus, and breadth versus depth of subjects studied illustrate that college curriculum and specific aspects of the college experience figure prominently in the economic returns to a college education. In addition, the lack of a return for students with some college who completed 40 or more credits (but no degree) suggests that credit production in the absence of a meaningful integration of courses contributes little to individual earnings and/or that there are considerable economic gains that can be attributed to the degree credential itself.[33]

Apart from attainment and selected aspects of the college experience, the findings from this analysis suggest that labor force experience constitutes an important component of the earnings

[33]To assess whether students who had completed substantially more than 40 credits had the same earnings as those at lower levels of attainment, a third regression was conducted using a revised credit variable that incrementally expanded credit bands with a top band of 120 or more credits. As with the prior models, the results of this regression failed to show a significant difference in earnings for students with less than an associate's degree, regardless of credit production.

equation. Based on the adjusted mean earnings, workforce experience during high school and during the four years immediately following high school can contribute significantly to individual earnings. While this association potentially reflects differences in motivation as well as experience, the findings nonetheless suggest that an enriching early work experience may provide students with an important channel for such motivation, and in effect mitigate some of the economic disadvantages of not having a college degree.

As with questions concerning college access, however, higher rates of unemployment and a greater likelihood of falling into the bottom third of the high school job index or the early work index suggest that some students, such as black and American Indian students (who are less likely to complete college), may have less access to enriching employment opportunities as well.

In broader terms, the association between education attainment, early employment and earnings suggest that the greatest gains in individual earnings are most likely to accrue through a combination of work and postsecondary education. And, while the responsibilities of employment may compete with educational activities, work experiences in some instances can be mutually facilitating and mutually reinforcing.

The last set of observations concerns the influences of socioeconomic background and economic mobility. In combination, several elements of students' background, including family income and high school academic preparation were associated with earnings both directly and indirectly through an association with higher attainment.

While the findings from this analysis reaffirm the central role of education (at both the high school and postsecondary level) as a vehicle of social mobility, in actuality, for the sophomore class of 1980, the earnings distribution of students 10 years after high school remains closely associated with socioeconomic status during high school. In other words, while education is positively related to individual earnings—irrespective of socioeconomic background—the direct and indirect effects of family income still constitute a dominant factor in the formation of an individual's earning capacity.

Nowhere is this impact more clearly illustrated than with the racial/ethnic background of students. After controlling for all other characteristics in the framework, there was no difference in student earnings by race/ethnicity. While at one level this finding suggests that something of an economic parity with respect to race/ethnicity exists in the labor market, it is crucial to recog-

nize the extent to which this balance is offset by the overall disparity in attainment for blacks, Hispanics, and American Indians compared with whites or Asians.[34]

While observed differences in earnings by race/ethnicity are more directly attributable to differences in attainment than other factors, the same cannot be said with respect to gender. Indeed, for the sophomore class of 1980, females were more likely to attend college than males and had equivalent baccalaureate and advanced degree rates of attainment. At the same time, after controlling for all factors in the model, there remains a pronounced earnings differential by gender with an adjusted mean earnings for females that is approximately 18 percent less than for males.

While this disparity may in part be accounted for by differences in occupational employment –which was not considered in the earnings framework– this finding nonetheless brings with it a number of implications including questions about comparative differences in a college education's economic return on investment, and in the level of college debt that students may ultimately be able to assume. At the same time, the positive association between attainment and earnings remains, regardless of gender. Therefore, while economic parity, by definition, cannot be achieved through offsets in attainment for those who are otherwise disadvantaged, attainment nonetheless serves to mitigate those disparities.

[34]For the sophomore class of 1980, blacks, Hispanics, and American Indians were less than half as likely as white students and less than one-third as likely as Asians to attain a bachelor's degree.

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Appendix A—Regression Analysis Control Variables

Table A1—Percentage distribution of 1980 sophomores who graduated from high school in 1982, by high school extracurricular experience, and by level of education attainment in 1992.

	Low extracurricular involvement	Middle extracurricular involvement	High extracurricular involvement
High school diploma only	42.1	30.1	27.8
Enrolled in any postsecondary education total	16.1	27.0	56.9
Some college (0–15 credits)	27.3	32.0	40.7
Some college (16–40 credits)	18.9	31.9	49.2
Some college (above 40 credits)	13.0	32.0	54.9
Associate's degree	22.4	29.3	48.4
Bachelor's degree	10.5	22.3	67.1
Master's degree	7.9	20.9	71.2

NOTE: Based on student's ranking in the bottom, middle and top third of the extracurricular index. Row percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B-So 1980-92), Data Analysis System

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Table A2—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, by high school extracurricular experience, by level of education attainment in 1992, and by gender.

	Low extracurricular involvement	Middle extracurricular involvement	High extracurricular involvement
		Males	
High school diploma only	$20,426	$22,518	$23,084
Enrolled in any postsecondary education total	24,671	26,893	27,736
Some college (0–15 credits)	24,742	26,825	23,193
Some college (16–40 credits)	25,170	24,856	22,661
Some college (above 40 credits)	21,590	24,441	24,926
Associate's degree or certificate	23,826	23,936	26,612
Bachelor's degree	26,304	28,937	30,678
Advanced degree	26,093	33,236	29,299
		Females	
High school diploma only	13,459	14,314	15,041
Enrolled in any postsecondary education total	20,858	20,564	22,048
Some college (0–15 credits)	17,615	19,672	19,243
Some college (16–40 credits)	21,208	16,985	18,367
Some college (above 40 credits)	25,593	17,064	17,705
Associate's degree or certificate	21,142	19,705	20,032
Bachelor's degree	20,828	24,859	24,414
Advanced degree	—	22,114	24,832

— Sample size too small for reliable estimate.

Note: Based on student's ranking in the bottom, middle and top third of the extracurricular index.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Study, Sophomore Cohort, Fourth Follow-up Survey 1992, Data Analysis System.

Table A3—Percentage distribution of 1980 sophomores who graduated from high school in 1982 and enrolled in postsecondary education, by timing of entry into college, and by level of education attainment in 1992.

	Direct entry (12 or fewer months)	Delayed entry (more than 12 months)
Total	80.6	19.4
Education attainment		
Some college (0–15 credits)	50.2	49.8
Some college (16–40 credits)	72.9	27.1
Some college (above 40 credits)	82.6	17.5
Associate's degree or certificate	72.2	27.8
Bachelor's degree	93.1	6.9
Advanced degree	94.7	5.4

NOTE: Row percentages may not add to 100 due to rounding.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980-92), Data Analysis System.

Table A4—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982 and enrolled in postsecondary education, by timing of entry into college, by level of education attainment in 1992, and by gender.

	Direct entry (12 or fewer months)	Delayed entry (more than 12 months)
	Males	
Total	$27,996	$24,135
Education attainment		
Some college (0–15 credits)	23,056	26,444
Some college (16–40 credits)	23,893	26,056
Some college (above 40 credits)	26,206	19,096
Associate's degree or certificate	25,625	22,913
Bachelor's degree	30,408	24,496
Advanced degree	30,180	
	Females	
Total	21,956	20,121
Education attainment		
Some college (0–15 credits)	19,363	19,088
Some college (16–40 credits)	19,295	15,015
Some college (above 40 credits)	17,902	24,452
Associate's degree or certificate	19,906	20,623
Bachelor's degree	24,415	20,922
Advanced degree	24,313	

Sample size too small for reliable estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980-92), Data Analysis System.

Table A5—Percentage of 1980 sophomores who graduated from high school in 1982 not enrolled in college in 1991, by level of education attainment in 1992.

	Not enrolled in college
High school diploma only	99.1
Enrolled in any postsecondary education	
Some college (0–15 credits)	96.0
Some college (16–40 credits)	94.9
Some college (above 40 credits)	93.4
Associate's degree or certificate	95.4
Bachelor's degree	97.4
Advanced degree	87.1

‡ Sample size too small for reliable estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980-92), Data Analysis System.

Table A6—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, by level of education attainment in 1992, by enrollment in college in 1991, and by gender.

	Not enrolled in college	Enrolled in college
	Males	
High school diploma or less total	$21,928	—
Enrolled in any postsecondary education		
Some college (0–15 credits)	25,143	—
Some college (16–40 credits)	24,237	—
Some college (above 40 credits)	26,098	—
Associate's degree or certificate	25,793	—
Bachelor's degree	30,686	$20,619
Advanced degree	32,415	26,501
	Females	
High school diploma or less total	14,338	—
Enrolled in any postsecondary education		
Some college (0–15 credits)	19,116	—
Some college (16–40 credits)	18,358	—
Some college (above 40 credits)	17,254	—
Associate's degree or certificate	19,547	18,467
Bachelor's degree	24,960	—
Advanced degree	25,653	19,887

— Sample size too small for reliable estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980-92), Data Analysis System.

Table A7—Percentage of 1980 sophomores who graduated from high school in 1982 who worked less than full-time full-year in 1991, by level of education attainment in 1992.

	Less than full-time full-year employed earning above minimum wage
High school diploma or less total	7.0
Enrolled in any postsecondary education total	
Some college (0–15 credits)	6.0
Some college (16–40 credits)	4.0
Some college (above 40 credits)	3.9
Associate's degree or certificate	3.7
Bachelor's degree	2.2
Advanced degree	2.5

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980-92), Data Analysis System.

Table A8—Percentage distribution of 1980 sophomores who graduated from high school in 1982, by level of education attainment in 1992, and by undergraduate major.

	Some college	Associate's degree	Bachelor's degree or higher
Total	100.0	100.0	100.0
Undergraduate major			
Business administration and management	23.6	8.9	20.6
Engineering	8.4	7.8	7.8
Social science	5.2	2.2	14.7
Computer and information science	10.2	4.6	6.2
Clerical and office administration	6.0	13.8	0.4
Liberal or general studies	7.2	7.0	4.6
Precision production	4.3	13.2	0.4
Health related technicians	2.0	10.6	3.8
Education	7.5	1.1	5.9
Dentistry, medicine and nursing	6.0	4.1	2.7
Communications	2.6	0.7	5.5
Consumer services	0.7	7.5	0.1
Marketing and distribution	1.1	3.8	2.8
Film, fine and performing art	3.1	0.6	3.6
Biological sciences	1.1	0.4	4.9
Protective services	2.4	3.0	1.0
Agriculture and resource management	2.3	1.9	1.3
Home economics	0.3	2.6	0.6
English or American literature	0.4	0.0	3.1
Physical science	0.7	0.1	2.5
Allied health: general and other	0.9	1.8	0.4
Law	0.7	1.7	0.1
Social work or social service	0.5	1.0	1.0
Mathematics	0.6	0.2	1.4
Philosophy	0.6	0.4	1.1
Architecture or environmental design	0.5	0.4	0.6
Graphic or industrial design	0.4	0.2	0.8
Transportation	0.6	0.3	0.3
Foreign language	0.0	0.0	1.1
Textiles/fashion	0.0	0.2	0.4
Communication technology	0.1	0.2	0.1
Other public administration	0.1	0.0	0.1
Military science and technology	0.0	0.0	0.1
Library or archival science	0.0	0.0	0.0

‡ Sample size too small for reliable estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980-92), Data Analysis System.

Table A9—Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, by level of education attainment in 1992, and by undergraduate major.

	Some college	Associate's degree	Bachelor's degree or higher	All students
Total	$21,766	$22,343	$27,066	$24,376
Undergraduate major				
Clerical and office administration	16,690	20,611	—	18,927
Architecture or environmental design	—	—	—	20,719
Film, fine and performing art	20,316	—	22,034	21,183
Biological sciences	—	—	22,864	22,658
Business administration and management	23,734	23,555	28,771	26,226
Communications	21,038	—	24,071	23,654
Communication technology	—	—	—	22,445
Computer and information science	20,306	22,009	33,251	25,865
Consumer services	—	14,515	—	14,948
Graphic or industrial design	—	—	—	22,758
Textiles fashion	—	—	—	23,202
Education	17,448	—	19,551	18,684
English or American literature	—	—	24,998	24,693
Engineering	23,279	25,812	34,837	29,090
Allied health: general and other	—	—	—	23,692
Dentistry, medicine and nursing	18,794	23,530	31,177	23,938
Health related technicians	23,805	23,123	27,335	24,604
Home economics	—	—	—	17,948
Foreign language	—	—	—	21,160
Law	—	—	—	20,177
Liberal or general studies	20,183	21,404	21,470	20,965
Library or archival science	—	—	—	—
Mathematics	—	—	29,417	26,963
Military science and technology	—	—	—	—
Marketing and distribution	—	23,067	29,598	25,728
Agriculture and resource management	24,699	—	29,735	27,700
Philosophy	—	—	21,321	18,654
Physical science	—	—	28,052	27,538
Precision production	22,649	24,501	—	23,832
Protective services	27,695	25,957	21,162	25,239
Social work or social service	—	—	—	16,798
Other public administration	—	—	—	25,161
Social science	26,053	—	27,929	27,206
Transportation	—	—	—	30,498

— Sample size too small for reliable estimate.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980-92), Data Analysis System.

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Appendix B—Variable Glossary

The variables used in this study are listed below. These items were either taken directly from the High School and Beyond Study Data Analysis System (see appendix C for a description of the DAS) or derived by combining one or more items in the survey. An asterisk indicates that the variable was derived.

Glossary Index

Family-Demographic
Gender ..... SEX
Ethnic racial background ..... RACE
Family income ..... FAMINC
Parent education attainment PARED2

High School Experience
Academic resource index ..... ACREDEX
Extracurricular index ..... COCRINDX*

Postsecondary Experience
Education attainment EDATT4*
Total credits completed ..... TCRED
Type of institution first attended ..... TRUSECT
Educational aspirations EDASP82
Timing of college entry ..... MONSTRT
Academic focus ..... ACFOCUS*
Program concentration index HERSIDX2*
Undergraduate major UGMAJ2*
Undergraduate GPA ..... GPA

Work Experience
Early work index ..... LFIA*
High school work index ..... SCHJOBGP*

Outcome Variables
1991 earnings Y4301B9Z

Population Sample Weights
HS&B general population weight PANEL5WT
Postsecondary education population weight PSEWT3

*Variables created for this analysis derived from other variables in the HS&B and PETS data file.
**Variables created for this analysis derived from external data and from other variables in the HS&B and PETS data file.

Academic focus **ACFOCUS**

Represents the preponderance of type of classes students completed as undergraduates. Academic focus was created for this study as a curriculum content variable based on the following approach: Using the PETS file, individual courses were coded as either vocational (indicating occupation specific training), general education (indicating liberal arts and general postsecondary preparation) or incidental (indicating leisure, entertainment or recreational classes). The coding of courses was based, in large part, on the content descriptions as published in "The New College Course Map and Transcript Files: Changes in Course-Taking and Achievement, 1972–1993" by Clifford Adelmen, Office of Educational Research and Improvement, U.S. Department of Education, 1995. Selected examples of vocational courses include agriculture and animal production, hotel management, radio/TV news broadcasting and writing, computer programming, metallurgical engineering, drafting, dental hygiene, speech-language pathology, hematology, fire protection, pipefitting and plumbing. Examples of general education include: East Asian studies, American Literature, biology, calculus, anthropology, economics, geography, history, political science and dance. Examples of incidental courses include aerobics, First Aid and Safety, Water Recreation, Yoga, Scuba/Skin Diving, coping skills, varsity athletics, games, sex and birth related health practices. A student's designation was based on which of the three categories accounted for the largest share of total credits earned. The academic focus variable was constructed to explore whether an emphasis on vocational versus liberal arts courses studied is associated with differences in student earnings after college.

Academic resource index **ACREDEX**

Based on a composite weighting of four criteria: intensity of the high school academic curriculum (e.g. the number of academic units completed by subject area), the high school percentile class rank, and high school GPA, and students' score on a standardized composite. The Acres variable grouped students by quintile. For this analysis, students were aggregated into three categories: the top 20 percent, the middle 60 percent, and the bottom 20 percent.

Extracurricular index **COCRINDX**

Reflects student depth (e.g. participant versus leadership role) and breath (e.g. number of different activities) of involvement in extracurricular activities while in high school. The extracurricular index was created for this study based on the total number of extracurricular activities (up to 16) and level of involvement (did not participate, active participant, leader) as reported in the second follow-up. Extracurricular experiences may help students acquire skills, knowledge, and experiences that can contribute to their effectiveness and position in the labor market later in life. Extracurricular involvement also potentially indicates a greater level of engagement in high school and reinforcement of classroom learning through outside experiences.

Education aspirations **EDASP82**

Potentially reflect student's interest and motivation concerning postsecondary education, training, and credentialing, as well as high school academic preparation and occupational/career aspirations.

Education attainment **EDATT4**

This variable represents a student's highest educational experience or education attained. This variable was derived using the transcript variable education attainment (HighDeg) for those with transcript information. For those without reported transcript information, the self-reported education attainment variable (HighDeg) was used to determine the highest level of education attained. Both variables were collapsed into seven categories: 1) high school or less; 2) some college (0–15 credits); 3) some college (16–40 credits); 4) some college (more than 40 credits); 5) Associate's Degree or Certificate; 6) Bachelor's degree; and 7) above a bachelor's degree.

Family income **FAMINC**

Student's family income in 1980 which has be grouped into four broad categories, under $15,000, $15,000 to $24,999, $25,000 to $39,999 and $40,000 and above. In 1998 dollars (based on the CPI-U) the bands would roughly be equivalent to under $30,000, $30,000–$49,999, $50,000 to $79,999 and $80,000 and above.

Undergraduate GPA **GPA**

Represents the cumulative undergraduate grade point average for credits completed. GPA scores were banded into quartiles based on the distribution of grades for all undergraduate students. To allow for potential differences in academic performance across sectors, the distribution of GPA scores are shown separately by sector. College GPA potentially reflects student's academic performance and mastery of subject matter as well as motivation, and potentially contributes to an individual's credentialing and labor market position.

Program concentration index **HERSIDX2**

Measures the depth versus breadth or dispersal of courses students completed across a possible 116 subjects. The index was created for this study and is based on an algorithm known as the Hirschman–Herfindahl concentration index[35] (that has been used to measure racial segregation in urban communities as well as industrial concentration). The index first calculates the percent share of courses completed in each academic program (Crscode) category. Each percent value is squared and all values are summed. The summed score is then inverted, resulting in a concentration score with a potential numeric range from 1 (indicating that all courses were within a single subject) to 1/N, with N representing the total number of program categories (indicating that all courses were evenly distributed across the equivalent of N subjects). The concentration index was constructed to explore whether differences in depth versus breadth of subjects studied is associated with differences in student earnings after college.

Early work index **LFIA**

Reflects the depth and breadth of students' labor force involvement in the first four years after high school (1983 to 1986). The early work index was created for this study. The index is a summary measure based on three criteria—cumulative months of employment over the four years, average annual job tenure (defined as total number of months divided by the number of employers), and average annual earnings. The index assigned up to 10 points for each criteria based on decile rankings. Total points were then summed resulting in a range from three to 30. For students who were missing values for one of the three criteria, summed scores were divided by two-thirds. Students who were missing values for two or three of the criteria were coded as missing. Students were then grouped into the top, middle, and bottom third based on their summary score. The index reflects the level of experience students have acquired in the work and potentially reflects gains in skill acquisition, work-related credentials, job tenure, and job content, all of which may contribute to higher earnings later in life.

Timing of college entry **MONSTRT**

Delay in college enrollment potentially reflects competing responsibilities, lack of interest or motivation, insufficient preparation or financial resources, or lack of planning. Students were classified into one of two groups based on time of entry into college: 12 or fewer months after high school (with a majority of this group entering in the fall following their senior year); and more than 12 months after high school (with a majority of this group entering college within two years after graduation from high school).

[35]For a brief overview see Bannock, Baxter, and Rees (1972).

HS&B general population weight **PANEL5WT**

General population weight used for the multivariate analysis and for tabulation of all students with no college. Covers all follow-ups of the sophomore class of 1980 (80–82–84–86–92).

Parent education attainment **PARED2**

Adjusted level of parents' highest education, taking into account parents' occupation. Conflicts between student-reported occupation and highest level of education for their parents were resolved only in those cases involving occupations that required at least some college, e.g., school teacher, lawyer. Conflicts were first resolved for father and mother separately. This variable takes the highest level of education of either parents. For this analysis, parent education attainment was grouped into three categories; no college, some college associate's, and bachelor's or higher.

Postsecondary education population weight **PSEWT3**

This population weight is the most restrictive of the three new weights offered for analyses of postsecondary attendance phenomena. It was established in the same manner with the same components as PSEWT2 except that the divisor consisted for the RAWWTS only for those HSBSTAT=1 students with complete or probably complete undergraduate records (COMPLETE=1 or COMPLETE=2), then multiplied by the factors from the 29 stratification cells. This is an expansion weight for the people who continued their education after high school at a true postsecondary level and whose undergraduate transcripts present a full course-taking record. Analysts are advised to use this weight for all topics derived from course-taking, e.g. credits, grades, course participation, etc. Analysts who wish to include those students for whom COMPLETE=3 but who had earned bachelor's degrees must modify PSEWT3.

Ethnic/racial background **RACE**

Reflects a students ethnic/racial background including six possible categories: White, Black, Hispanic, Asian or Pacific Islander, Native American or Alaskan native and Missing. This information is a recode of variables from CATI, earlier follow-ups, and other (Adelman) information that moved 26 cases from missing to known status based on the PETS Student file.

High school job index **SCHJOBGP**

The student job index was created for this study and represents the extent to which students were employed (the average weekly number of hours worked and approximate duration of employment) during the high school sophomore (using variable FY24), summer after sophomore (using variable FY36) and senior year (using variable FY37). The student job index potentially reflects early interest in career and labor force activities as well as the acquisition of basic job skills and potentially reflects motivation and positive early experiences that can influence labor market position later in life.

Gender **SEX**

Indicates a student's sex. Gender variable was used for comparisons of student earnings and in the multivariate analysis.

Total credits completed **TCRED**

Represents a count of the total number of postsecondary credits earned at the undergraduate. The source variable for this information comes from the transcript file.

Type of institution first attended **TRUSECT**

Reflects the type (Carnegie classification and control) of postsecondary institution students first attended. Sector attended is broadly associated with institutional selectivity and potentially may influence after college earnings directly or indirectly through the educational services and resources provided including instruction and student services, institutional prestige and organizational and alumni networks.

Undergraduate major field of study **UGMAJ2**

Categorical variable showing the undergraduate major both for degree and non-degree holders with a total of 34 categories. For students who completed a bachelor's or associate's degree the variable was derived from MAJCOD5. For non-degree holders the variable was derived from Y4203N01- major at first institution with a recoding of the response categories to conform with the categories as reported by MAJCOD5.

Appendix C—Technical Notes and Methodology

The High School and Beyond Fourth Follow-up Study

High School and Beyond (HS&B) is a longitudinal study that followed two cohorts of students. It began with a nationally representative sample of over 58,000 students who were high school sophomores and seniors in 1980. An extensive survey was administered in the base year along with a battery of cognitive tests. Both cohorts were followed up at two-year intervals through 1986, and the sophomore cohort was followed up a fourth time in 1992. Cognitive tests were administered to the sophomore cohort during the first follow-up survey, when most were high school seniors. In addition, high school transcripts were collected and coded. The fourth follow-up included a collection of postsecondary transcripts for members of the sophomore cohort who had continued their education beyond high school. The HS&B Postsecondary Education Transcript Study (PETS) includes transcript information to September 1993.

Sample weights. All analyses in this report are weighted to compensate for unequal probability of selection into the HS&B sample and to adjust for nonresponse. Because this report relies extensively on PETS data and requires complete information on postsecondary course taking, all analyses of students with at least some postsecondary education were weighted based on those students for whom complete transcript information was available (weight variable PSEWT3). For students with no college, the analysis used the general population weight from the fourth follow-up (Panel5). Because students with and without a college education required separate weights, population totals or summary statistics representing all students have not been provided. All of the regression models used in this analysis relied on the Panel5 weight. The selection of this weight was necessary to have sufficient representation of students at all levels of attainment.[36]

Accuracy of Estimates

The statistics in this report are estimates derived from a sample. Two broad categories of error occur in such estimates: sampling and nonsampling errors. Sampling errors occur because observations are made only on samples of students, not on entire populations. Nonsampling er-

[36]An alternative series of regression models were run, which "spliced" the row and column values for the dummy variable *no college* from the correlation matrix using the Panel5 weight into the correlation matrix using the PSEWT3. The resultant regression outputs, however, yielded substantially different (and often illogical) results, compared with the regression outputs based on either weight alone.

rors occur not only in sample surveys but also in complete censuses of entire populations. Nonsampling errors can be attributed to a number of sources: inability to obtain complete information about all students in all institutions in the sample (some students or institutions refused to participate, or students participated but answered only certain items); ambiguous definitions; differences in interpreting questions; inability or unwillingness to give correct information; mistakes in recording or coding data; and other errors of collecting, processing, sampling, and imputing missing data.

Data Analysis System

The estimates presented in this report were produced using the HS&B: 80/92 Data Analysis System (DAS). The DAS software makes it possible for users to specify and generate their own tables from the HS&B: 80/92 data. With the DAS, users can replicate or expand upon the tables presented in this report. In addition to the table estimates, the DAS calculates proper standard errors and weighted sample sizes for these estimates. For example, table D1 contains standard errors that correspond to table 1 in the text, and was generated by the DAS. If the number of valid cases is too small to produce a reliable estimate (fewer than 30 cases), the DAS prints the message "low N" instead of the estimate.

All variables in the DAS are integers. To preserve decimal precision for certain variables, values in the DAS have been multiplied by a factor of 10. For example, grade point averages range from 0–400 in the DAS. When averages for such variables appear in this report, estimates and standard errors were divided by the appropriate factor of 10 to restore the original scale.

In addition to tables, the DAS will also produce a correlation matrix of selected variables to be used for linear regression models. Included in the output with the correlation matrix are the design effects (DEFTs) for each variable in the matrix. Since statistical procedures generally compute standard errors based on an assumption of simple random sampling, the standard errors must be adjusted with the design effects to take into account HS&B's complex sample design. (See discussion under "Statistical Procedures" below for the adjustment procedure.)

For more information about the HS&B: 80/92 and other Data Analysis Systems, consult the NCES DAS website (www.nces.ed.gov/das) or its West coast mirror site (www.pedar-das.org), or contact:

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Table C1—Standard errors for Table 1: Average 1991 earnings of 1980 sophomores who graduated from high school in 1982, by level of education attainment in 1992, by gender, by race/ethnicity, by family income in 1980, and by parent's education attainment.

	High school or less	Some college (0–15 credits)	Some college (15–40 credits)	Some college (above 40 credits)	Associate's degree or certificate	Bachelor's degree	Advanced degree
				Males			
Total	$406	$1,690	$1,015	$1,259	$721	$567	$1,043
Race/ethnicity							
White	477	2,030	1,243	1,533	763	625	1,128
Black	1,064		1,963	2,669	2,610	2,002	3,235
Hispanic	1,094	1,785	3,085	3,178	3,845	2,137	5,320
Asian or Pacific Islander						1,969	6,509
Family income in 1980							
$0–14,999	930	2,413	2,150	1,842	2,571	1,452	3,303
$15,000–24,999	864	1,728	1,070	1,423	1,118	1,259	1,981
$25,000–39,999	784	1,464	1,626	1,374	1,095	808	1,532
$40,000 or more	1,658	8,201	4,775	4,288	2,321	1,308	1,627
Parent's education attainment							
No college	523	1,256	997	1,611	1,284	1,031	2,485
Some college/associate's	765	1,197	1,246	2,759	948	1,133	1,718
Bachelor's degree or higher	1,287	7,426	3,977	1,888	1,573	907	1,370
				Females			
Total	362	1,296	919	1,146	734	526	783
Race/ethnicity							
White	415	1,600	944	1,611	808	535	877
Black	1,078	2,231	3,498	1,164	2,588	1,030	2,460
Hispanic	979	1,906	1,776	1,886	1,766	1,344	3,833
Asian or Pacific Islander						1,855	2,057
Family income in 1980							
$0–14,999	828	1,578	1,507	1,486	986	2,908	2,244
$15,000–24,999	562	1,348	1,331	1,525	1,923	906	1,393
$25,000–39,999	1,045	1,600	1,664	1,106	1,307	861	1,194
$40,000 or more	1,035		1,902	1,257	1,520	940	1,588
Parent's education attainment							
No college	436	2,237	956	999	1,166	892	1,861
Some college/associate's	713	1,957	1,751	3,015	820	1,167	1,217
Bachelor's degree or higher	1,251	2,339	1,778	1,037	2,496	681	1,218

— Sample size too small for reliable estimate.

NOTE: Native Americans were not included due to low Ns.

SOURCE: U.S. Department of Education, National Center for Education Statistics, 1980 High School and Beyond Longitudinal Study of 1980, Sophomores (HS&B: So 1980/92), Data Analysis System.

Statistical Procedures

Two types of statistical procedures were employed in this report: testing differences between means (or proportions), testing for linear trends, and adjustment of means after controlling for covariation among several variables. Each procedure is described below.

Differences Between Means

The descriptive comparisons were tested in this report using Student's *t* statistic. Differences between estimates are tested against the probability of a Type I error,[37] or significance level. The significance levels were determined by calculating the Student's *t* values for the differences between each pair of means or proportions and comparing these with published tables of significance levels for two-tailed hypothesis testing.

Student's *t* values may be computed to test the difference between estimates with the following formula:

$$t = \frac{E_1 - E_2}{\sqrt{se_1^2 + se_2^2}} \qquad (1)$$

Where E_1 and E_2 are the estimates to be compared and se_1 and se_2 are their corresponding standard errors. This formula is valid only for independent estimates. When estimates are not independent, a covariance term must be added to the formula:

$$\frac{E_1 - E_2}{\sqrt{se_1^2 + se_2^2 - 2(r)se_1\ se_2}} \qquad (2)$$

Where r is the correlation between the two estimates.[38] This formula is used when comparing two percentages from a distribution that adds to 100. If the comparison is between the mean of a subgroup and the mean of the total group, the following formula is used:

$$\frac{E_{sub} - E_{tot}}{\sqrt{se_{sub}^2 + se_{tot}^2 - 2p\ se_{sub}^2}} \qquad (3)$$

[37]A Type I error occurs when one concludes that a difference observed in a sample reflects a true difference in the population from which the sample was drawn, when no such difference is present.

[38]U.S. Department of Education, National Center for Education Statistics, *A Note from the Chief Statistician*, no. 2, 1993.

Where p is the proportion of the total group contained in the subgroup.[39] The estimates, standard errors, and correlations can all be obtained from the DAS.

There are hazards in reporting statistical tests for each comparison. First, comparisons based on large t statistics may appear to merit special attention. This can be misleading, since the magnitude of the t statistic is related not only to the observed differences in means or percentages but also to the number of students in the specific categories used for comparison. Hence, a small difference compared across a large number of students would produce a large t statistic.

A second hazard in reporting statistical tests for each comparison occurs when making multiple comparisons among categories of an independent variable. For example, when making paired comparisons among different levels of income, the probability of a Type I error for these comparisons taken as a group is larger than the probability for a single comparison. When more than one difference between groups of related characteristics or "families" are tested for statistical significance, one must apply a standard that assures a level of significance for all of those comparisons taken together.

Comparisons were made in this report only when $p \leq .05/k$ for a particular pairwise comparison, where that comparison was one of k tests within a family. This guarantees both that the individual comparison would have $p \leq .05$ and that for k comparisons within a family of possible comparisons, the significance level for all the comparisons will sum to $p \leq .05$.

For example, when comparing males and females only one comparison is possible. In this family, $k=1$, and there is no need to adjust the significance level. When students are divided into five racial/ethnic groups and all possible comparisons are made, then $k=10$ and the significance level for each test within this family of comparisons must be $p \leq .05/10$, or $p \leq .005$. The formula for calculating family size (k) is as follows:

$$k = \frac{j(j-1)}{2} \tag{3}$$

Where j is the number of categories for the variable being tested. For example, in the case of a variable with five categories such as race/ethnicity, one substitutes 5 for j in equation 3:

$$k = \frac{5(5-1)}{2} = 10$$

[39] Ibid.

Adjustment of Means to Control for Covariation Among Several Variables

Tabular results are limited by sample size when attempting to control for the multiplicity of factors that may account for the variation observed between two variables. For example, when examining the average number of credits completed, it is impossible to know to what extent the observed variation is due to socioeconomic status (SES) differences and to what extent it is due to differences in other factors related to SES, such as type of institution attended, intensity of enrollment, and so on. However, if a nested table were produced showing SES within type of institution attended, within enrollment intensity, the cell sizes would be too small to identify the patterns. When the sample size becomes too small to support controls for another level of variation, one must use other methods to take such variation into account.

To overcome this difficulty, multiple linear regression was used to obtain means that were adjusted for covariation among a list of control variables.[1] Adjusted means for subgroups were obtained by regressing the dependent variable on a set of student and enrollment characteristics. Substituting ones or zeros for the subgroup characteristic(s) of interest and the mean proportions for the other variables results in an estimate of the adjusted mean for the specified subgroup, holding all other variables constant. For example, consider a hypothetical case in which two variables, race/ethnicity and SES, are used to describe an outcome, Y (such as the number of credits completed). The variables race/ethnicity and SES are recoded into dummy variables:

Race/ethnicity	R
Black, non-Hispanic	1
All others	0

and

SES	S
Low SES	1
All others	0

The following regression equation is then estimated from the correlation matrix output from the DAS:

[1] For more information about weighted least squares regression, see Michael S. Lewis-Beck, *Applied Regression: An Introduction*, Vol. 22 (Beverly Hills, CA: Sage Publications, Inc, 1980); William D. Berry and Stanley Feldman, Multiple Regression in Practice, Vol. 50 (Beverly Hills, CA: Sage Publications, Inc., 1987)

$$\hat{Y} = a + b_1 R + b_2 S \qquad (4)$$

To estimate the adjusted mean for any subgroup evaluated at the mean of all other variables, one substitutes the appropriate values for that subgroup's dummy variables (1 or 0) and the mean for the dummy variable(s) representing all other subgroups. For example, suppose we had a case where Y was being described by race/ethnicity (*R*) and SES (*S*), coded as shown above, and the means for *R* and *S* are as follows:

Variable	Mean
R	0.109
S	0.282

Suppose the regression equation results in:

$$\hat{Y} = 51.07 + (17.63)R + (-22.46)S$$

To estimate the adjusted value for black students, one substitutes the appropriate parameter values into equation 4.

Variable	Parameter	Value
a	51.07	—
R	17.63	1.000
S	-22.46	0.282

This results in:

$$\hat{Y} = 51.07 + (17.63)(1) + (-22.46)(0.282) = 62.37$$

In this case, the estimated mean number of credits is 62.37 and represents the expected outcome for non-Hispanic black students who resemble the average student with respect to the other variables in the model (in this example, SES).

It is relatively straightforward to produce a multivariate model using the DAS, since one of the DAS output options is a correlation matrix, computed using pairwise missing values and properly weighted to account for the complex sample design and for nonresponse.[2] This matrix can be used by most statistical software packages as the input data for least-squares regression.

[2] Although the DAS simplifies the process of making regression models, it also limits the range of models. Analysts who wish to use other than pairwise treatment of missing values or to estimate probit/logit models (are are the most appropriate for models with categorical dependent variables) can apply for a restricted data license from NCES. See John H. Aldrich and Forrest D. Nelson, Linear Probability, Logit and Probit Models (Quantitative Applications in the Social Sciences, Vol. 45) (Beverly Hills, CA: Sage University Press, 1984).

That is the approach used for this report, with an additional adjustment to incorporate the complex sample design into the statistical significance tests of the parameter estimates (described below).

Most statistical software packages assume simple random sampling when computing standard errors of parameter estimates. Because of HS&B's complex sample design, this assumption is incorrect. A better approximation of the standard errors is to multiply each standard error by the average design effect of the dependent variable (DEFT), where the DEFT is the ratio of the true standard error to the standard error computed under the assumption of simple random sampling. It is calculated by the DAS and produced with the correlation matrix.